BONDING

As atoms bond with each other, they decrease their _____ energy, thus creating more stable arrangements of matter.

Why do nonmetals want to gain electrons?

_____

_____

What kind of ion does a nonmetal form? _____

How do you determine which electrons are removed from a representative metal to form a cation?

_____

_____

How do you determine which electrons are removed from a transition metal to form a cation?

_____

_____

_____

_____

1) Predict the ionic charge for the following representative elements.

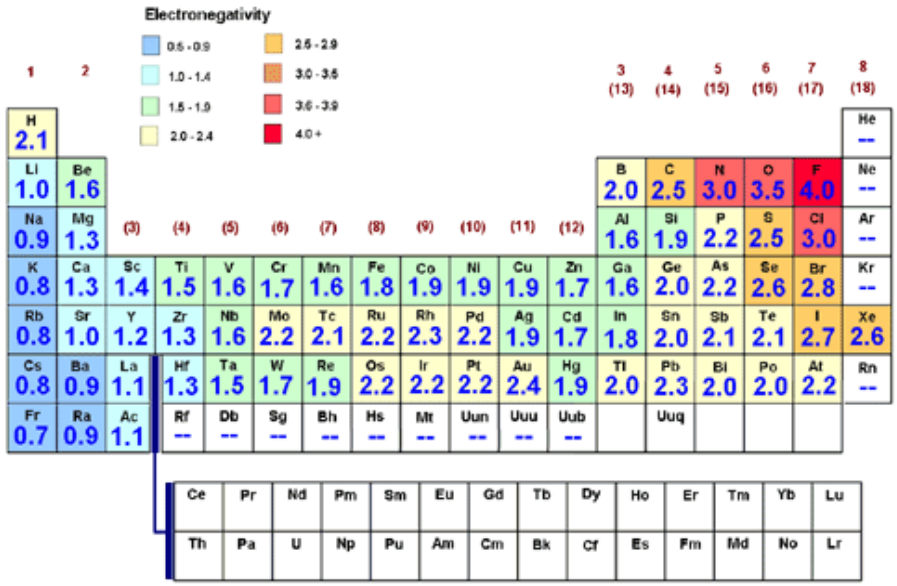
a) rubidium (Rb) ____ b) bromine (Br) ____ c) silicon (Si) ____

d) barium (Ba) ____ e) boron (B) ____ f) selenium (Se) ____

IONIC BONDS

- Anions and cations are held together by opposite charges, _____ attraction.
- The bond is formed through the _____ of electrons.
- Ionic bonds occur between metals and _____.
- Note that only the arrangement of electrons has changed. Nothing about the atom's _____ has changed.
- Properties: a _____ structure; compounds are _____; are hard solids; have _____ melting points and high boiling points because of strong forces between ions; conduct electricity in the _____ (melted) and dissolved states (in aqueous solution) and thus are _____; and have an electronegativity difference greater than _____.

2) How many valence electrons must an atom have in its outer energy level in order to be considered stable? _____



3) Use electronegativity values to validate that NaCl is predominately ionic.

4) Use electronegativity values to validate that CaF_2 is predominately ionic.

COVALENT BONDS

- Electrons are (transferred or shared).
- Covalent bonds occur between 2 nonmetals because nonmetals hold onto their _____ electrons. They can't give away electrons to bond, yet, they still want noble gas configuration.
- Covalent bonds can be polar or nonpolar. State the difference between polar and nonpolar. _____

_____

_____

- Properties: low melting points and boiling points because the forces between molecules are _____; are poor conductors of electricity, so they are considered nonelectrolytes; tend to be gases, liquids or _____ solids; many are polar in nature; electronegativity difference for two elements in a covalent compound is _____ than 1.7.

5) Use electronegativity values to validate that CO_2 is predominately covalent.

6) Do atoms that share a covalent bond have an ionic charge? _____

_____

7) Ionic (I), covalent (C), or both (B)?

a) NaCl _____ b) $CaCO_3$ _____ c) CS_2 _____ d) Zn_3PO_4 _____

e) GaH_3 _____ f) N_2O_5 _____ g) H_2O _____ h) CuO _____

i) FCl _____ j) SO_3 _____ k) $SiCl_4$ _____ l) BN _____

MULTIPLE BONDS

A single bond is formed from the sharing of ____ valence electrons, a double bond from 4 valence electrons, and a triple bond from ____ valence electrons.

Bond strength trend: _____

Bond length trend: _____

Bond energy (bond enthalpy) is the energy required to _____ a bond. Stronger bonds have greater bond energy.

Bond energy trend: _____

Hydrogen and the halogens CANNOT form double or triple bonds!

THE WETTER WAY

$$\#bonds = \frac{\Sigma e-_{after} - \Sigma e-_{before}}{2}$$

Apply the Wetter Way to CO_2 and sketch the Lewis dot diagram.

#e- after ____ + (_____ x 2) = _____

CO_2 $\#bonds = \frac{(\_\_\_ - \_\_\_)}{2} = \_\_\_\_$

#e- before ____ + (_____ x 2) = _____

Apply the Wetter Way to NH_3 and sketch the Lewis dot diagram.

#e- after ____ + (_____ x 3) = _____

$$NH_3 \qquad \#bonds = \frac{(\_\_\_\_ - \_\_\_\_)}{2} = \_\_\_\_$$

#e- before ____ + (_____ x 3) = _____

8) On your own paper, determine the number of bonds and draw the dot-dash diagram for HBr.

9) On your own paper, determine the number of bonds and draw the dot-dash diagram for N_2.

10) On your own paper, determine the number of bonds and draw the dot-dash diagram for HCN.

MACROMOLECULES AND NETWORK SOLIDS

Macromolecules have large numbers of atoms linked by _____ bonds. Macromolecules have _____ melting and boiling points and are frequently brittle. There are 4 basic kinds of biological macromolecules. These are carbohydrates (like starch), lipids (like fats), nuclei acids (like _____), and proteins. Macromolecules are in your _____ and fingernails. Man-made macromolecules include polymers like PVC and _____. A **network solid** is a macromolecule in which the atoms are bonded _____ in a continuous network. In a network solid there are no individual molecules and the entire crystal is the molecule. Examples of network solids include diamond, quartz and _____.

METALLIC BONDS

Metals hold onto their valence electrons very weakly. The electrons are said to be _____. Metal atoms release their valence electrons into a _____ of electrons shared by all of the metal atoms. The bond that results from this shared pool of valence electrons is called a **metallic bond**. Metals are good electrical and thermal _____ due to their free valence electrons. Metals generally have extremely high melting points and boiling points because it is difficult to pull metal atoms completely away from the group of cations and attracting electrons. Metals are _____ (able to be hammered into sheets) and are also _____ (able to be drawn into wire) because of the mobility of the particles. Metals have _____ (are shiny). A mixture of elements that has metallic properties is called an _____.