

# HONORS CHEMISTRY BONDING REVIEW

2013

key

- Atoms bond to form compounds in order to
  - Increase stability by lowering their energy
  - Achieving a noble gas e<sup>-</sup> configuration
- When chemical bonds are formed, energy is released. Energy is absorbed when chemical bonds are broken.

3. Name the three basic types of bonds between atoms.

- 1) ionic
- 2) covalent
- 3) metallic

4. Electronegativity difference:

- Two of the same nonmetal atoms (0)
- Two different nonmetals (0-1.6)
- A metal and nonmetal (1.7 & above)

- nonpolar covalent
- polar covalent
- ionic

5. The degree of ionic character increases as the electronegativity difference increases. List the following compounds from most to least ionic character. a) N-O b) F-F c) H-O d) K-I



- Ionic bonds involve the transfer of electrons between atoms. When the positive and negative ions are formed the result is an electrostatic attraction between ions.
- Covalent bonds involve the sharing of electrons between atoms. The equal or symmetrical sharing of electrons between two of the same nonmetal atoms results in a nonpolar covalent bond. The unequal or asymmetrical sharing of electrons between two different nonmetal atoms forms a polar covalent bond.
- When substances are covalently bonded together, they generally form molecules. These molecules can have an equal or unequal distribution of electrons between them. Molecules that have symmetrical distribution of charge are said to be nonpolar. Polar molecules have the asymmetrical or unequal distribution of charge.

9. Nonpolar molecules generally result when the molecule has a Linear or tetrahedral shape when all four surrounding atoms (ex. CH<sub>4</sub>) are the same.

10. Complete the following chart:

Molecule	Electron dot/shape	Polarity
H <sub>2</sub>	H × H linear	nonpolar
Br <sub>2</sub>	:Br × Br: linear	nonpolar
O <sub>2</sub>	× O × O : Linear	nonpolar
N <sub>2</sub>	N × N : Linear	nonpolar
CO <sub>2</sub>	δ- : O : × C × O : δ- Linear	nonpolar
CCl <sub>4</sub>	δ- : Cl : × C × Cl : δ- tetrahedral	nonpolar
BF <sub>3</sub>	δ- : F : × B × F : δ- planar	nonpolar
BeH <sub>2</sub>	H × Be × H linear	nonpolar

sp<sup>3</sup> hybrid

sp<sup>2</sup> hybrid

sp hybrid

11. Molecules numbered 1-4 are nonpolar molecules because there are only two atoms with a nonpolar covalent bond between them. This can only lead to an equal distribution of charge/electrons.
12. Noble gases are often thought of as monatomic molecules. These molecules are classified as nonpolar molecules.
13. Polar molecules generally result from molecules that have a bent or pyramidal shape. These structures always lead to an unequal distribution of charge. Tetrahedral molecules can also form polar molecules if the four atoms around the central atom are not the same. (ex.  $\text{CH}_3\text{Cl}$ )
14. H-Cl is an example of a diatomic molecule that is a polar molecule. Since there are only two atoms in the molecule, if the bond between them has an unequal distribution of electrons, the molecule must also have an asymmetrical distribution of charge.

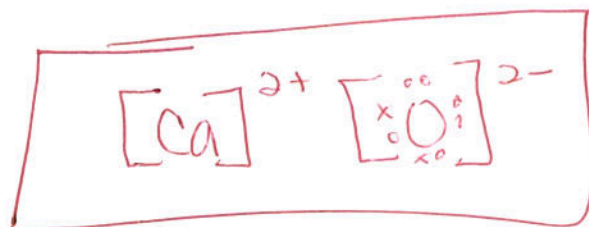
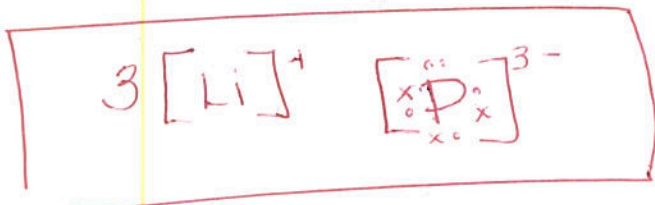
15. Complete the following chart:

<u>Molecule</u>	<u>Electron dot/Shape</u>	<u>Polarity</u>
HF	$\begin{array}{c} \delta^+ \text{H} \times \text{F} \delta^- \\ \cdot \cdot \\ \cdot \cdot \end{array}$	Linear polar
$\text{H}_2\text{O}$	$\begin{array}{c} \delta^+ \text{H} \times \text{O} \delta^- \\ \cdot \cdot \\ \times \cdot \\ \text{H} \delta^+ \end{array}$	bent polar
$\text{NH}_3$	$\begin{array}{c} \delta^+ \text{H} \times \text{N} \delta^- \\ \cdot \cdot \\ \times \cdot \\ \text{H} \delta^+ \end{array}$	pyramidal polar
$\text{CH}_3\text{Cl}$	$\begin{array}{c} \text{H} \delta^+ \\ \times \\ \delta^+ \text{H} \times \text{C} \times \text{H} \delta^+ \\ \cdot \cdot \\ \delta^- \text{Cl} \delta^- \end{array}$	tetrahedral polar



16. The bonds found between metal atoms are known as metallic bonds. They are characterized by a sea of mobile electrons or delocalized electrons. . Examples: Gold (Au) ring, Iron (Fe) bar, Copper (Cu) tubing

17. Draw the Lewis Dot diagrams for  $\text{Li}_3\text{P}$  and  $\text{CaO}$ . (IONIC)



18. List the properties of ionic solids. Give an example.

- nonconductors in solid phase; good melted or aqueous
- hard + brittle
- high melting point

19. One of the above properties should be that ionic solids do not conduct electricity. When these solids are melted or dissolved in water (aq) they become good conductors.

20. What is a hybrid orbital? Give an example and show it is formed. What element undergoes  $sp^3$ ,  $sp^2$ , and  $sp$  hybridization?

hybrid orbitals form when different sublevels combine to create degenerate bonding orbitals

Carbon -  $sp^3$

Boron -  $sp^2$

beryllium -  $sp$

21. A coordinate covalent bond results from the sharing of electrons between two atoms, where one atom contributed both electrons, instead of each atom contributing one.

22. Write out an equation that shows a coordinate covalent bond forming between a proton ( $\text{H}^+$ ) and a water molecule.

