Honors Chemistry

**A. Completion**

Use this completion exercise to check your knowledge of the terms and your understanding of the

concepts introduced in this chapter. Each blank can be completed with a term, short phrase, or number.

The elements in the periodic table are arranged in vertical columns called \_\_\_\_\_\_\_\_\_\_\_\_\_. Groups 1A through 8A make up the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Metals are on the \_\_\_\_\_\_\_\_\_\_\_ and lower sides of the periodic table. Nonmetals are on the right and \_\_\_\_\_\_\_\_\_\_\_\_ sides. The charges of the ions of the \_\_\_\_\_\_\_\_\_\_\_\_ elements can be determined by the position of these elements in the periodic table. Most \_\_\_\_\_\_\_\_\_\_\_\_\_\_ metals have more than one common ionic charge. When a cation has more than one ionic charge, a \_\_\_\_\_\_\_\_\_\_\_\_\_\_ is used in the name. \_\_\_\_\_\_\_\_\_cations are made of one \_\_\_\_\_\_\_\_\_\_\_-charged atom, while monatomic \_\_\_\_\_\_\_\_\_\_\_\_ are made of one negatively-charged atom. Most cations are monatomic, while most anions are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Binary ionic compounds are named by writing the name of the \_\_\_\_\_\_\_\_\_\_\_\_\_ followed by the name of the \_\_\_\_\_\_\_\_\_\_\_\_\_. Names of binary compounds end in \_\_\_\_\_\_\_. For example, NaI is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Chemical bonds result from the sharing or transfer of \_\_\_\_\_\_\_\_\_\_\_. Bonded atoms attain the stable electron configuration of a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

The transfer of valence electrons produces positively-charged ions, or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and negatively-charged ions, called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. The attraction between these two types of ions forms an \_\_\_\_\_\_\_\_\_\_\_ bond. Nearly all ionic substances are \_\_\_\_\_\_\_\_\_\_\_\_ solids at room temperature. In these solids the total \_\_\_\_\_\_\_\_\_\_\_\_ charge is balanced by the total \_\_\_\_\_\_\_\_\_\_\_\_\_\_ charge. Ionic compounds in general melt at very \_\_\_\_\_\_\_\_\_\_\_ temperatures. This is because the \_\_\_\_\_\_\_\_\_\_\_\_ attractive forces between the ions result in a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ structure, which is very stable. Ionics compounds conduct an electric current when \_\_\_\_\_\_\_\_\_\_\_\_\_ and when \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Metals consist of metal ions packed together and surrounded by a sea of their \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. This arrangement constitutes the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ bond. The electron mobility accounts for the excellent \_\_\_\_\_\_\_\_\_\_\_\_\_\_ conductivity of metals and helps explains why metals are \_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_.

When atoms share electrons to gain the \_\_\_\_\_\_\_\_\_\_\_\_ configuration of a noble gas, the bonds formed are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. A \_\_\_\_\_\_\_\_\_\_\_\_ pair of valence electrons constitutes a \_\_\_\_\_\_\_\_\_\_\_\_\_\_single covalent bond. Sometimes two or three pairs of electrons may be shared to give \_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ covalent bonds. In some cases only one of the atoms in a bond provides the pair of bonding electrons; this is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

When like atoms are joined by a covalent bond, the bonding electrons are shared \_\_\_\_\_\_\_\_\_\_\_\_\_, and the bond is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. When the atoms in a bond are not the same, the bonding electrons are shared \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and the bond is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. The degree of polarity of a bond between any two atoms is determined by consulting a table of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Some molecules are \_\_\_\_\_\_\_\_\_\_\_\_\_ because they contain polar covalent bonds.

The attractions between opposite poles of polar molecules are called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. The weakest intermolecular force is called \_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_ forces, formed when the electrons of any

atom or molecule temporarily form a \_\_\_\_\_\_\_\_\_\_. The strongest intermolecular force is the

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. These intermolecular forces determine whether a covalent compound will be a solid,

liquid, or gas at room temperature.

As a general rule, molecules adjust their three-dimensional shapes so that the valence shell electron pairs around a central atom are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ as possible. This is the guiding principle in the valence-shell electron-pair repulsion, or \_\_\_\_\_\_\_\_\_\_\_\_\_\_ theory of molecular geometries.

Molecular compounds are composed of two or more \_\_\_\_\_\_\_\_\_\_\_\_\_. The representative particle of a molecular compound is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Binary molecules are composed of two \_\_\_\_\_\_\_\_\_\_\_\_ elements. The name of this type of compound ends in \_\_\_\_\_\_\_\_. Prefixes are used to show how many \_\_\_\_\_\_\_\_\_\_\_\_ of each element are present in a molecule of the compound. For example, As2S5 is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Compounds of the general formula HX, where X is an anion, are named as \_\_\_\_\_\_\_\_ when in

water solution. HBr, named as an acid, is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ acid.

**B. True-False**

Classify each of these statements as always true (AT); sometimes true (ST); or never true (NT).

\_\_\_\_\_\_\_ 1. In forming a chemical compound, an atom of an element gains more electrons.

\_\_\_\_\_\_\_ 2. An anion is any atom or group of atoms with a positive charge.

\_\_\_\_\_\_\_ 3. The names of polyatomic ions end in –*ite* or –*ate* .

\_\_\_\_\_\_\_ 4. In polyatomic ions for which there is an –ite/–ate pair, the –ite ending will always indicate one less

 oxygen atom than the –ate ending.

\_\_\_\_\_\_\_ 5. In writing a formula for an ionic compound, the net ionic charge of the formula must be zero.

\_\_\_\_\_\_\_ 6. In a polar covalent bond the more electronegative atom has a slight positive charge.

\_\_\_\_\_\_\_ 7. A molecule with polar bonds must itself be polar.

\_\_\_\_\_\_\_ 9. To attain a noble gas electron structure, a nitrogen atom must lose its five valence electrons.

\_\_\_\_\_\_\_10. The compound OF2 contains two double covalent bonds.

\_\_\_\_\_\_\_11. Unshaired pairs of electrons affect the shape of molecules.

\_\_\_\_\_\_\_12. Covalent compounds are network solids.

**C. Questions**

Answer the following questions in the space provided.

1. Name the following compounds and tell what type of compound they are (ionic or molecular)

 a. FeBr3

 b. CBr4

 c. Na2Cr2O7

2. Write the formulas for the following compounds.

a. sodium chlorate

1. lead (II) phosphate
2. magnesium hydrogen carbonate

3. State the number of electrons gained or lost in forming each of these ions.

|  |  |
| --- | --- |
| a. Mg2+ | c. Br- |
| b. Ca2+ | d. Ag+ |

4. Name each of the ions in Question #3 and tell whether they are anions or cations.

|  |  |
| --- | --- |
| a. Mg2+ | c. Br- |
| b. Ca2+ | d. Ag+ |

5. Use electron dot structures to describe the chemical formulas of the ionic compounds formed when the

 following elements combine.

 a. strontium and fluorine

1. magnesium and chlorine
2. sodium and oxygen
3. aluminum and sulfur

6. Draw electron dot diagrams for the following molecules or polyatomic ions:

 a. Br2 b. HCN c. NH4+

7. Determine whether each of the following bonds is nonpolar covalent, polar covalent or ionic, using

 differences in electronegativities. Show your work.

 a. BeCl2

 b. O2

 c. K2S

8. Arrange the following intermolecular forces in order of increasing strength:

dipole, dispersion (London) forces, hydrogen bonds.

9. From the list below select the compound that is best described by each statement, and write the formula

 in the space next to it.

 H2O, CCl4, NH3, CO2

1. Which compound represents a linear molecule?
2. Which compound best represents a tetrahedral molecule?
3. Which compound would show a bent molecular structure?
4. Which compound’s molecules have a pyramidal shape?
5. Which compound(s) is/are polar?

10. Write formulas for the following acids:

 a. hypochlorous acid b. hydrofluoric acid c. phosphoric acid

11. Indicate the hybrid orbitals used by each carbon atom in the following compound:

 H3C-C=C-CC-CH3

 | |

 H H

12. Name the following molecular compounds using **both** traditional names and the Stock System.

1. N2O3
2. CS2

13. Write chemical formulas for the following compounds:

1. sulfur trioxide
2. tetraiodine nonoxide
3. sulfur (VI) oxide
4. phosphorus (V) chloride