Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Pd: \_\_\_ Ast: \_\_\_\_\_

**Chemical Compounds Study Guide**

1. Describe valence electrons.

*Valence electrons are the electrons furthest from the nucleus, on the “outer shell” of the atom.*

1. How can you determine the number of valence electrons a neutral atom has?

*You can look at the one’s digit of the group number for elements in groups 1-2 and 13-18.*

1. Why do atoms form chemical bonds?

*Atoms form chemical bonds to satisfy the octet rule and fill their outer shell with valence electrons.*

1. How can you tell how many elements make up a compound by looking at the chemical formula?

*Each element only has one capital letter, so you can count the capital letters for unique elements in a compound.*

1. What do the letters and subscripts (small numbers) mean in a chemical formula?

*The letters in a chemical formula represent the chemical symbol for specific elements. A subscript indicates the number of atoms for the element preceding it in the formula.*

1. Compare the two types of chemical bonds discussed in class:
   1. Compare the role of valence electrons in ionic and covalent bonds.

*Ionic – valence electrons are gained or lost to give the atom an electrical charge*

*Covalent – valence electrons are shared among atoms*

* 1. Compare what holds the atoms together (*what “bonds” them*) in ionic and covalent bonds.

*Ionic – opposing charges hold the atoms together*

*Covalent – shared electrons hold the atoms together*

* 1. Compare the types of elements involved in ionic and covalent bonds.

*Ionic – usually involves a metal and a nonmetal*

*Covalent – usually involves two nonmetals*

1. How does an atom or group of atoms become an ion?

*An atom becomes an ion when it gains or loses electrons and becomes electrically charged as a result.*

1. Why are some atoms positive and others negative?

*When an atom loses valence electrons, its overall charge becomes positive (positive ion).*

*When an atom gains valence electrons, its overall charge becomes negative (negative ion).*

1. How can you tell what the charge of an ion will be?

*Metals in groups 1-3 will lose electrons and become positive ions (G1=+, G2=2+, G3=3+).*

*Nonmetals in groups 15-17 will gain electrons and become negative ions (G17=-, G16=2-, G15=3-)*

1. What is a polyatomic ion?

*A polyatomic ion is a group of multiple atoms that has a charge. They behave as one unit and form a bond with another ion just as if they were a single element.*

1. When two ions bond, what is the charge of the resulting compound?

*Ions bond to form a neutral compound. There is no charge in the resulting compound.*

1. When two ions form a compound, which ion is listed first?

*The positive ion is listed first, so it will usually be the metal.*

1. When two ions form a compound, how do you know if the ending should be “…ide” or “…ate”?

*If the negative ion is a single element (monatomic), the ending will be “…ide”. If the negative ion is polyatomic, the ending will be “…ate”.*

1. What are some common properties if ionic compounds?

*Ionic compounds tend to form a crystal structure, an organized, alternating 3D pattern.*

*They tend to have a high melting point, causing them to be solid at room temperature.*

*They also tend to conduct electricity very well in liquid form or in solution.*

1. How can you tell how many covalent bonds an atom can form?

*An atom can form as many covalent bonds as it needs valence electrons to fill its outer shell. If it needs 3 valence electrons, it can form 3 covalent bonds.*

1. Why are some covalent compounds considered “polar” molecules? How does this affect the molecule?

*Sometimes, one atom has a stronger pull on the shared electrons than the other, causing them to move toward it. This causes one end of the molecule to have a slight negative charge and the opposite end to have a slight positive charge. The resulting molecule will behave as though it is like a magnet.*

1. Why don’t we usually see lone atoms of oxygen or nitrogen in nature, instead observing oxygen (O2) or nitrogen (N2) molecules? What types of covalent bonds allow these molecules?

*Lone atoms of these elements are less stable than their molecular form. By bonding with another atom, they can fill their outer shell and become stable.*

1. What are some common properties of covalent molecules?

*Covalent molecules tend to have a lower melting point than ionic compounds.*

*They are also often poor electrical conductors.*

1. When plants undergo photosynthesis, they use energy from the Sun to convert carbon dioxide and water into glucose and oxygen. The chemical formula for glucose is shown below. Identify the elements that make up a molecule of glucose and the number of atoms for each.

C6H12O6 Element Number of Atoms

*carbon 6*

*hydrogen 12*

*oxygen 6*

1. Write the correct charge for the following elements when they form ions:
   1. Li ***+***b. O ***2-***c. Cl ***-***
2. Write CORRECT NAME for the following IONIC compounds:
   1. MgF2 *magnesium fluoride*
   2. Al2O3 *aluminum oxide*
   3. K2SO4 *potassium sulfate*
3. Write the CORRECT FORMULA for the following IONIC compounds:
   1. ammonium fluoride *NH4F*
   2. sodium bicarbonate *NaHCO3*
   3. calcium chloride *CaCl2*
4. Write the CORRECT NAME for the following COVALENT molecules:
   1. SO2 *sulfur dioxide*
   2. N2O3 *dinitrogen trioxide*
   3. CCl4 *carbon tetrachloride*
5. Write the CORRECT FORMULA for the following COVALENT molecules:
   1. carbon monoxide *CO*
   2. nitrogen trioxide *NO3*
   3. dihydrogen monoxide *H2O*
6. Identify the following molecules/compounds as IONIC or COVALENT:
   1. H2S *covalent*
   2. K2O *ionic*
   3. Al2S3 *ionic*
   4. CO2 *covalent*
   5. N2O *covalent*
   6. CaBr2 *ionic*