Name_____

Honors Chem: Chemical composition and Nomenclature

1.Briefly state each of these laws.

a). Conservation of mass
matter is neither created nor destroyed; it just changes form

b). Constant composition
The same compound always contains exactly the same proportion of elements by weight.

c). Multiple proportion
Consider two elements that form more than one compound. For a fixed mass of one element the different masses of the second element in the different compounds are related to each other by small whole number ratios.

2.Determine the number of atoms of each element in the following chemical formulas.

a) $Mg(OH)_2$ **Mg = 1 atom, O = 2 atoms, H = 2 atoms**

b) PCl_5 **P = 1, Cl = 5**

c) $C_{33}H_{32}N_4O_4Fe$ **C = 33, H = 32, N = 4, O =4, Fe =1**

3.Complete the following table.

Fundamental Particle	Charge	Mass (g)
Electron	**-1**	**9.11×10^{-28} g**
Proton	**+1**	**1.67×10^{-24} g**
Neutron	**0**	**1.67×10^{-24} g**
Alpha particle	**2+**	**6.64×10^{-24} g**

4.Identify the location of electrons, protons and neutrons in an atom.

Protons and neutrons are located in the nucleus.

Electrons are located outside of the nucleus.

5.Define the terms *isotope*, *atomic number* and *mass number*.

Atoms with the same atomic number, but with different mass numbers are isotopes. The difference in mass number is a result of different numbers of neutrons.

atomic number - the number of protons of an element.

mass number - the total number of protons and neutrons in an atom.

The number of electrons in a neutral atom is equal to the atomic number.

6.Given the following elements determine the number of electrons, protons and neutrons.

a) $^{109}_{47}Ag$ **$e^- = 47$** **$n^0 = 62$** **$p^+ = 47$**

b) $^{24}_{12}Mg$ **$e^- = 12$** **$n^0 = 12$** **$p^+ = 12$**

c) $^{24}_{13}Al$ **$e^- = 12$** **$n^0 = 11$** **$p^+ = 13$**

d) $^{107}_{47}Ag^+$ **$e^- = 46$** **$n^0 = 60$** **$p^+ = 47$**

7.List the name and chemical formula for each of the elements that exist as diatomic elements.

Name	Formula	Name	Formula
Hydrogen	**H_2**	**Chlorine**	**Cl_2**
Nitrogen	**N_2**	**Bromine**	**Br_2**
Oxygen	**O_2**	**Iodine**	**I_2**
Fluorine	**F_2**		

8.List the rules for naming the common binary ionic compounds. Name the compounds listed.

Binary compounds containing a metallic and a nonmetallic element are usually ionic. The correct chemical name is composed of the name of the cation followed by the name of the anion.
Monatomic cations take their names from the metallic element followed by the word "ion." ("ion" is not included in the name of the compound!) If the metal can exist in more than one charge state, its name should be followed by a Roman numeral in parentheses indicating the charge of the ion. There is an older method for naming two differently charged ions of the same metal. In this method the ending "-ic" is added to the root of the Latin name of the metal for the the higher charged ion and the ending "-ous" is added for

the lower charged ion. The Roman numeral method is preferred, but the older method is still widely used and students should be familiar with both. Monatomic anions take their names from the nonmetallic element with an added "-ide" ending.

NaCl	**sodium chloride**	$CaBr_2$	**calcium bromide**
K_2S	**potassium sulfide**	Cu_3N_2	**copper (II) nitride**

9.List the rules for naming the common polyatomic cations and anions. Name the ionic compounds listed.

There are only two common polyatomic cations. They are :
NH_4^+ is the ammonium ion . H_2^{2+} is the mercury (I) ion or mercurous ion

Polyatomic anions
A few common polyatomic anions end in "-ide." These include hydroxide ion (OH^-) the cyanide ion (CN^-) and the peroxide ion (O_2^{2-}). Most of the common polyatomic anions contain oxygen and are called *oxyanions*. Most elements that form oxyanions are nonmetals and can form more than one oxyanion. (They can combine with different numbers of oxygen atoms to form anions.) If the element can form two oxyanions, the one with the greatest number of oxygen atoms is named by adding the ending "-ate" to the root of the element's name. The name of the anion with fewer oxygen atoms is formed by adding the ending "-ite" to the root of the element's name. If the element can form four oxyanions (the halogens can do this) then prefixes are also used. The prefix "per-" indicates the greatest number of oxygen atoms and the prefix "hypo-" indicates the least number of oxygen atoms.

If the anion has a charge of 2- or greater, it is not necessary that both of the balancing charges come from the same cation or the same kind of ion. The compound is named by including the names of both cations, in either order, followed by the name of the anion. Often metal ion(s) and hydrogen ion(s) will be included to balance the negative charge. In this case, either the name hydrogen is included after the name of the metal ion or the prefix "bi-" is added to the name of the anion.

NH_4NO_3	**ammonium nitrate**	NaCN	**sodium cyanide**
KNO_2	**potassium nitrite**	$BaSO_4$	**barium sulfate**
$Ca(ClO_4)_2$	**calcium perchlorate**	Hg_2O	**mercury (I) oxide or mercurous oxide**
$CuCO_3$	**copper (II) carbonate or cupric carbonate**	$NaHCO_3$	**sodium bicarbonate**

10.List the general rules for naming binary covalent compounds. Name the compounds listed.

Binary compounds containing only nonmetal elements:
The element written first is named first and the second element retains the modified binary ending of –ide. In addition a Latin or Greek prefix is associated with the name of each element to indicate the number of atoms of each element in the periodic table. For example,

1	**mono**	**6**	**hexa**
2	**di**	**7**	**hepta**
3	**tri**	**8**	**octa**
4	**tetra**	**9**	**nona**
5	**penta**	**10**	**deca**

The prefix mono is never used for naming the first element.
The final *o* or *a* of the prefix is often dropped when the element begins with a vowel
These prefixes are not used in naming ionic compounds.

NO	**nitrogen monoxide**	SO_3	**sulfur trioxide**
NO_2	**nitrogen dioxide**	P_4O_{10}	**tetraphosphorus decoxide**
N_2O_4	**dinitrogen tetroxide**	NF_3	**nitrogen trifluoride**

11.Many familiar substances have common, unsystematic names. In each of the following cass, give the correct systematic name:

a)	saltpeter (KNO_3)	**potassium nitrate**
b)	soda ash (Na_2Co_3)	**sodium carbonate**
c)	lime (CaO)	**calcium oxide**
d)	baking soda ($NaHCO_3$)	**sodium bicarbonate or sodium hydrogen carbonate**
e)	lye (NaOH)	**sodium hydroxide**
f)	muriatic acid (HCl)	**hydrochloric acid**
g)	milk of magnesia ($Mg(OH)_2$)	**magnesium hydroxide**
h)	dry ice (CO_2)	**carbon dioxide**
i)	ammonia (NH_3)	**trihydrogen nitride**

12.Write the chemical formula of each substance mentioned in the following word descriptions.

a) Zinc carbonate can be heated to form zinc oxide and carbon dioxide.
$ZnCO_{3(s)} \rightarrow ZnO_{(s)} + CO_{2(g)}$

b) On treatment with hydrofloric acid, silicon dioxide forms silicon tetrafluoride and water.
$SiO_{2(s)} + 4HF_{(g)} \rightarrow SiF_{4(g)} + 2H_2O_{(g)}$

c) Sulfur dioxide reacts with water to form sulfurous acid.
$SO_{2(g)} + H_2O_{(l)} \rightarrow H_2SO_{3(aq}$