Name: _____

AP Chemistry Worksheet 3: *Naming Inorganic Compounds*

For each problem below, write the equation and show your work. Always use units and box in your final answer.

1. Give the name for each of the following ionic compounds:
   a. AlF_3
   b. $Fe(OH)_2$
   c. $Cu(NO_3)_2$
   d. $Ba(ClO_4)_2$
   e. Li_3PO_4
   f. Hg_2S
   g. $Ca(C_2H_3O_2)_2$
   h. $Cr_2(CO_3)_3$
   i. K_2CrO_4
   j. $(NH_4)_2SO_4$

2. Write the chemical formula for each of the following compounds:
   a. copper (I) oxide
   b. potassium peroxide
   c. aluminum hydroxide
   d. zinc nitrate
   e. mercury (I) bromide
   f. iron (III) carbonate
   g. sodium hypobromite

3. Give the name or chemical formula, as appropriate, for each of the following acids:
   a. $HBrO_3$
   b. HBr
   c. H_3PO_4
   d. hypochlorous acid
   e. iodic acid
   f. sulfurous acid

4. Give the name or chemical formula, as appropriate, for each of the following molecular substances:
   a. SF_6
   b. IF_5
   c. XeO_3
   d. dinitrogen tetroxide
   e. hydrogen cyanide
   f. tetraphosphorous hexasulfide

5. Write the balanced chemical equation for each reaction given below.
   a. Zinc carbonate can be heated to form zinc oxide and carbon dioxide
   b. On treatment with hydrofluoric acid, silicon dioxide forms silicon tetrafluoride and water.
   c. Sulfur dioxide reacts with water to form sulfurous acid.
   d. Liquid butane fuel (C_4H_{10}) burns in the presence of oxygen gas.
   e. Perchloric acid reacts with cadmium to form cadmium perchlorate and a gas.
   f. A solution of sodium bromide reactions with a solution of vanadium (III) nitrate to form a brightly colored precipitate.

Name: _____

AP Chemistry Worksheet 4: *Atomic and Molecular Masses*

For each problem below, write the equation and show your work. Always use units and box in your final answer.

1. What isotope is used as the standard in establishing the atomic mass scale?

2. The atomic weight of magnesium is reported as 24.3, yet no atom of magnesium has the mass of 24.3 amu. Explain.

3. Only two isotopes of copper occur naturally, Cu-63 (abundance 69.09 percent) and Cu-65 (abundance 30.91 percent). Calculate the average atomic mass of copper.

4. Determine the molar mass of each of the following compounds:
   a. N_2O_5
   b. $FeCO_3$
   c. $Ca(C_2H_3O_2)_2$
   d. $(NH_4)_3PO_4$
   e. sodium nitrate
   f. copper (II) sulfate
   g. disilicon hexabromide

5. Calculate the percentage by mass of oxygen in the following compounds:
   a. NO_2
   b. CH_3COOCH_3
   c. $Cr(NO_3)_3$
   d. $(NH_4)_2CO_3$

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AP Chemistry Worksheet 5: *Balancing Equations & Patterns of Reactivity*

For each problem below, write the equation and show your work. Always use units and box in your final answer.

1. Balance the following equations:
   a. $CO\ (g) + O_2(g) \rightarrow CO_2\ (g)$
   b. $N_2O_5\ (g) + H_2O\ (l) \rightarrow HNO_3\ (aq)$
   c. $PCl_5\ (l) + H_2O\ (l) \rightarrow H_3PO_4\ (aq) + HCl\ (aq)$
   d. $CH_4\ (g) + Br_2\ (g) \rightarrow CBr_4\ (l) + HBr\ (g)$
   e. $C_5H_{10}O_2\ (l) + O_2\ (g) \rightarrow CO_2\ (g) + H_2O\ (l)$
   f. $Cr(OH)_3\ (s) + HClO_4\ (aq) \rightarrow Cr(ClO_4)_3\ (aq) + H_2O\ (l)$

2. Write balanced chemical equations to correspond to each of the following descriptions:
   a. Solid calcium carbide, CaC_2, reacts with water to form an aqueous solution of calcium hydroxide and acetylene gas, C_2H_2.
   b. When solid potassium chlorate is heated, it decomposes to form solid potassium chloride and oxygen gas.
   c. Solid zinc metal reacts with sulfuric acid to form hydrogen gas and an aqueous solution of zinc sulfate.
   d. When liquid phosphorous trichloride is added to water, it reacts to form a solution of phosphorous acid and hydrochloric acid.
   e. When hydrogen sulfide gas is passes over solid hot iron (III) hydroxide, the reaction produces solid iron (III) sulfide and gaseous water.

3. a. What products form when a hydrocarbon is completely combusted in air?

b. Write a balanced chemical equation for the combustion of octane, C_8H_{18} (l), in air.

c. How can you determine the chemical formula of the product formed when the metallic element calcium combines with the nonmetallic element oxygen, O_2?

d. Write the balanced chemical equation for the reaction described in (c).

4. Write a balanced chemical equation for the reaction that occurs when

a. the hydrocarbon heptane, C_7H_{16} (l), is combusted in air

b. the gasoline additive MTBE (methyl tertiary-butyl ether), $C_5H_{12}O$ (l), burns in air

c. Rb (s) reacts with water

d. Mg(s) reacts with Cl_2 (g)

5. Balance the following equations, and indicate what type of reaction each one is:

a. Al (s) + Cl_2 (g) --> $AlCl_3$ (s) _____

b. C_2H_4 (g) + O_2 (g) --> CO_2 (g) + H_2O (l) _____

c. Li(s) + N_2 (g) --> Li_3N (s) _____

d. $PbCO_3$ (s) --> PbO (s) + CO_2 (g) _____

e. $C_7H_8O_2$ (l) + O_2 (g) --> CO_2 (g) + H_2O (l) _____

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AP Chemistry Worksheet 6: *The Mole*

For each problem below, write the equation and show your work. Always use units and box in your final answer.

1. The molecular formula of aspartame, the artificial sweetener marketed as NutraSweet, is $C_{14}H_{18}N_2O_5$.

a. What is the molar mass of aspartame?

b. How many moles of aspartame are present in 1.00 mg of aspartame? (1000 mg = 1g)

c. How many molecules of aspartame are present in 1.00 mg of aspartame?

d. How many hydrogen atoms are present in 1.00 mg of aspartame?

2. A sample of glucose, $C_6H_{12}O_6$, contains 2.03×10^{21} atoms of carbon.

a. How many atoms of hydrogen does it contain?

b. How many molecules of glucose does it contain?

c. How many moles of glucose does it contain?

d. What is the mass of the sample in grams?

3. Calculate the following amounts:

   a. How many moles of chloride ions are in 0.0750 g of magnesium chloride?

   b. What is the mass, in grams, of 3.50×10^{-3} mol of aluminum sulfate?

   c. What is the mass, in grams, of 1.75×10^{20} molecules of caffeine, $C_8H_{10}N_4O_2$?

   d. What is the molar mass of cholesterol if 0.00105 mol weigh 0.406 g?

4. Calculate the number of molecules in:
   a. 0.0666 mol propane, C_3H_8, a hydrocarbon fuel

   b. A 50.0 mg tablet of acetaminophen, $C_8H_9O_2N$, an analgesic solid under the name of Tylenol

   c. A tablespoon of table sugar, $C_{12}H_{22}O_{11}$, weighing 10.5 g

5. The allowable concentration level of vinyl chloride, C_2H_3Cl, in the atmosphere in a chemical plant is 2.0×10^{-6} g/L.
   a. How many moles of vinyl chloride in each liter does this represent?

   b. How many molecules per liter is this?

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AP Chemistry Worksheet 7: *Empirical and Molecular Formulas*

For each problem below, write the equation and show your work. Always use units and box in your final answer.

1. Determine the empirical formula of each of the following compounds if a sample contains
   a. 0.104 mol K, 0.052 mol C, and 0.156 mol O

   b. 5.28 g Sn and 3.37 g F

   c. 87.5 percent N and 12.5 percent H by mass

2. Determine the empirical formulas of the compounds with the following compositions by mass
   a. 10.4 percent C, 27.8 percent S, and 61.7 percent Cl

   b. 21.7 percent C, 9.6 percent O, and 68.7 percent F

3. What is the molecular formula of each of the following compounds?
   a. empirical formula CH_2, molar mass = 84 g/mol

   b. empirical formula NH_2Cl, molar mass = 51.5 g/mol

Determine the empirical and molecular formulas of each of the following substances:

a. Ibuprofen, a headache remedy contains 75.69 percent C, 8.80 percent H, and 15.51 percent O by mass; molar mass about 206 g

b. Benzene contains only carbon and hydrogen and is 7.74% hydrogen by mass. The molar mass of benzene is 78.1 g/mol.

Many homes in rural America are heated by propane gas, a compound that contains only carbon and hydrogen. Complete combustion of a sample of propane produced 2.641 g of carbon dioxide and 1.442 g of water as the only products. Find the empirical formula of propane. (Hint: Figure out how many moles of C and H were produced. They all came from the fuel.)

(This is probably the hardest problem in the whole packet!) Menthol, the substance we can smell in mentholated cough drops, is composed of C, H, and O. A 0.1005 g sample of menthol is combusted, producing 0.2829 g of CO_2 and 0.1159 g of H_2O.

a. What is the empirical formula for menthol?

b. If the compound has a molar mass of 156 g/mol, what is its molecular formula?

Name: _____

AP Chemistry Worksheet 8: *Chemical Equations and Calculations*

For each problem below, write the equation and show your work. Always use units and box in your final answer.

1. Why is it essential to use balanced chemical equations in solving stoichiometry problems?

2. The fermentation of glucose, $C_6H_{12}O_6$, produces ethyl alcohol, C_2H_5OH, and CO_2 as shown here:

$$C_6H_{12}O_6\,(aq) \;\text{-->}\; 2\,C_2H_5OH(aq) \;+\; 2\,CO_2\,(g)$$

   a. How many moles of CO_2 are produced when 0.300 mol of $C_6H_{12}O_6$ reacts in this fashion?

   b. How many grams of $C_6H_{12}O_6$ are needed to form 2.00 g of C_2H_5OH?

   c. How many molecules of CO_2 form when 2.00 g of C_2H_5OH are produced?

3. Aluminum sulfide reacts with water to form aluminum hydroxide and hydrogen sulfide.
   a. Write the balanced chemical equation for this reaction.

   b. How many grams of aluminum hydroxide are obtained from 10.5 g of aluminum sulfide?