Worksheet 2: Naming Compounds and Stoichiometry

1. Fill in the table below by providing the name or formula for each compound.

	Formula	Name
(a)	CuO	**copper(II) oxide**
(b)	**$Fe(NO_3)_3$**	iron(III) nitrate
(c)	K_2CO_3	**potassium carbonate**
(d)	**$CoCl_3$**	cobalt(III) chloride
(e)	PbO_2	**lead(IV) oxide**
(f)	**P_2O_5**	diphosphorous pentoxide
(g)	H_2SO_4	**sulfuric acid**
(h)	**HBr**	hydrobromic acid

2. Use the periodic table to predict the formula and the name of the binary compound formed from the following pairs of elements:

Element	Ion Formed	Element	Ion Formed	Formula	Name
Na	Na^+	Cl	Cl^-	$NaCl$	sodium chloride
Ca	**Ca^{2+}**	N	**N^{3-}**	**Ca_3N_2**	**calcium nitride**
Mg	**Mg^{2+}**	S	**S^{2-}**	**MgS**	**magnesium sulfide**
Rb	**Rb^+**	F	**F^-**	**RbF**	**rubidium fluoride**
Cs	**Cs^+**	P	**P^{3-}**	**Cs_3P**	**cesium phosphide**

3. For each question below, first balance the equation and then determine the answer to the question.

   a. 1 $C_2H_5OH(l)$ + 3 $O_2(g)$ → 2 $CO_2(g)$ + 3 $H_2O(g)$

      How many moles of ethanol will react with 2.500 moles of oxygen gas?

      $$\left(2.500\text{ mol }O_2\right)\cdot\left(\frac{1\text{ mol }C_2H_5OH}{3\text{ mol }O_2}\right)=0.8333\text{ mol }C_2H_5OH$$

   b. 4 $Fe(s)$ + 3 $O_2(g)$ → 2 $Fe_2O_3(s)$

      How many moles of iron will react with 3.00 moles of oxygen gas?

      $$\left(3.00\text{ mol }O_2\right)\cdot\left(\frac{4\text{ mol Fe}}{3\text{ mol }O_2}\right)=4.00\text{ mol Fe}$$

4. The purpose of this question is to develop a conceptual understanding of the magnitude of Avogadro's number. Consider what would happen if 1.000 mole of pennies were distributed equally among the earth's population, which is currently estimated at 7×10^9. ($N_A = 6.022 \times 10^{23}$)

   a. How many pennies would each person get?

      $$\left(\frac{1.000\text{ mol pennies}}{1\text{ earth}}\right)\cdot\left(\frac{6.022\times10^{23}\text{ pennies}}{1\text{ mol pennies}}\right)\cdot\left(\frac{1\text{ earth}}{7\times10^{9}\text{ people}}\right)=9\times10^{13}\ \frac{\text{pennies}}{\text{person}}$$

   b. If you spend your pennies at the rate of one million dollars per day, how many years will it take to spend all of them? Use dimensional analysis to construct a clear, easy-to-follow solution.

      $$\left(\underline{8}.603\times10^{13}\text{ pennies}\right)\cdot\left(\frac{1\text{ dollar}}{100\text{ pennies}}\right)\cdot\left(\frac{1\text{ day}}{1\times10^{6}\text{ dollars}}\right)\cdot\left(\frac{1\text{ year}}{365.25\text{ days}}\right)=2000\text{ years}$$

c. Which has more monetary value, 15.00 moles of pennies or 0.800 moles of quarters?

$$(15.00 \text{ mol pennies})\cdot\left(\frac{6.022\times10^{23} \text{ pennies}}{1 \text{ mol pennies}}\right)\cdot\left(\frac{1 \text{ dollar}}{100 \text{ pennies}}\right)=9.033\times10^{22} \text{ dollars}$$

$$\boxed{(0.800 \text{ mol quarters})\cdot\left(\frac{6.022\times10^{23} \text{ quarters}}{1 \text{ mol quarters}}\right)\cdot\left(\frac{1 \text{ dollar}}{4 \text{ quarters}}\right)=1.20\times10^{23} \text{ dollars}}$$

OR

without converting to individual dollars, but rather to a mole of dollars

$$(15.00 \text{ mol pennies})\cdot\left(\frac{1 \text{ dollar}}{100 \text{ pennies}}\right)=0.1500 \text{ mol dollars}$$

$$\boxed{(0.800 \text{ mol quarters})\cdot\left(\frac{1 \text{ dollar}}{4 \text{ quarters}}\right)=0.200 \text{ mol dollars}}$$

d. The mass of one penny is 2.45 g. What is the mass of 1.00 mole of pennies?

$$\boxed{(1.00 \text{ mol pennies})\cdot\left(\frac{6.022\times10^{23} \text{ pennies}}{1 \text{ mol pennies}}\right)\cdot\left(\frac{2.45 \text{ g}}{\text{penny}}\right)=1.48\times10^{24} \text{ g}}$$