P 9.2 (pg 1 of 2) **Stoichiometry – using mass** Name_____

Do your work on another piece of paper. Write down your steps and be sure and put units, identifiers and descriptors on your answers. Concern yourself with significant figures.

1. $SO_2 + O_2 + H_2O \rightarrow H_2SO_4$

   a. Balance the skeleton equation above.
   b. What mass of H_2SO_4 will be produced from 365 g of SO_2 and an excess amount of the other reactants?

   c. If you had 38.4 g of O_2 and an excess amount of the other reactants, what mass of H_2SO_4 can be produced?

2. Iron reacts with oxygen gas to produce iron(III) oxide. When this occurs slowly, it is known as rusting.
   a. Write the balanced equation that describes this reaction.

   b. Given 14 g of iron, what mass of oxygen gas would be needed to completely react with this iron?

   c. Given 14 g of iron, and the amount of oxygen from part b determine the mass of iron(III) oxide that would be produced.

3. How many grams water is produced from the complete combustion of 10.0 g of glucose, $C_6H_{12}O_6$?
   Be sure and first write a balanced equation.

4. Ethane, C_2H_6 can be completely burned in a proper furnace.
   a. Write the balanced equation that represents this combustion reaction.

   b. How many grams of oxygen would be needed to completely burn 65.4 g of ethane?

   c. When 65.4 g of ethane is completely combusted, how many grams of carbon dioxide will be produced?

   d. When 65.4 g of ethane is completely combusted, how many grams of water will be produced?

5. $CuFeS_2 + O_2 \text{ ----> } Cu + FeO + SO_2$

   a. Balance the reaction above. (beware: pay attention to the unit labels on the numbers.)
   b. How many kg of copper can be produced from 127.6 kg of $CuFeS_2$?

   c. How many kg of oxygen are needed to go with the 127.6 kg of $CuFeS_2$?

In these problems, the ratio that is from the coefficients in the balanced equation highlighted in red. The answers are in blue. Ideally you should keep the entire calculation in your computer and NOT round them off as you go. Do ALL you rounding at the END.

Be sure and put your work on paper clearly and label your numbers with **units** (moles, grams, etc), **identifiers** (O_2, H_2O, etc,) and **descriptors** (needed, produced, etc).

1. See the answers below:
   a. $2SO_2 + O_2 + 2H_2O \rightarrow 2H_2SO_4$
   b. $365\text{ g } SO_2\left(\frac{1molSO_2}{64.1gSO_2}\right)\left(\frac{2H_2SO_4}{2SO_2}\right)\left(\frac{98.1gH_2SO_4}{1molH_2SO_4}\right) = 559\text{ g } H_2SO_4$
   c. $38.4\text{ g } O_2\left(\frac{1molO_2}{32gO_2}\right)\left(\frac{2H_2SO_4}{1O_2}\right)\left(\frac{98.1gH_2SO_4}{1molH_2SO_4}\right) = 235\text{ g } H_2SO_4$
2. See the answers below:
   a. $4\text{ Fe} + 3\text{ O}_2 \rightarrow 2\text{ Fe}_2\text{O}_3$
   b. $14\text{ g Fe}\left(\frac{1molFe}{55.85gFe}\right)\left(\frac{3O_2}{4Fe}\right)\left(\frac{32gO_2}{1molO_2}\right) = 6.0\text{ g of oxygen needed}$
   c. $14\text{ g Fe}\left(\frac{1molFe}{55.85gFe}\right)\left(\frac{2Fe_2O_3}{4Fe}\right)\left(\frac{159.7gFe_2O_3}{1molFe_2O_3}\right) = 2.0 \times 10^1\text{ g of Fe}_2\text{O}_3\text{ should be produced}$
3. $C_6H_{12}O_6 + 6\text{ O}_2 \rightarrow 6\text{ CO}_2 + 6\text{ H}_2\text{O}$

   $10.0\text{ g } C_6H_{12}O_6\left(\frac{1molC_6H_{12}O_6}{180gC_6H_{12}O_6}\right)\left(\frac{6H_2O}{1C_6H_{12}O_6}\right)\left(\frac{18gH_2O}{1molH_2O}\right) = 6.00\text{ g of water can be produced}$
4. See answers below:
   a. $2\text{ C}_2\text{H}_6 + 7\text{ O}_2 \rightarrow 4\text{CO}_2 + 6\text{ H}_2\text{O}$
   b. $65.4\text{ g } C_2H_6\left(\frac{1molC_2H_6}{30.1gC_2H_6}\right)\left(\frac{7O_2}{2C_2H_6}\right)\left(\frac{32gO_2}{1molO_2}\right) = 243\text{ g of O}_2$
   c. $65.4\text{ g } C_2H_6\left(\frac{1molC_2H_6}{30.1gC_2H_6}\right)\left(\frac{4CO_2}{2C_2H_6}\right)\left(\frac{44gCO_2}{1molCO_2}\right) = 191\text{ g of CO}_2$
   d. $65.4\text{ g } C_2H_6\left(\frac{1molC_2H_6}{30.1gC_2H_6}\right)\left(\frac{6H_2O}{2C_2H_6}\right)\left(\frac{18gH_2O}{1molH_2O}\right) = 117\text{ g of H}_2\text{O}$
5. See answers below:
   a. $2\text{CuFeS}_2 + 5\text{O}_2 \rightarrow 2\text{Cu} + 2\text{FeO} + 4\text{SO}_2$
   b. $127.6\text{ kg CuFeS}_2\left(\frac{1molCuFeS_2}{183.54gCuFeS_2}\right)\left(\frac{2Cu}{2CuFeS_2}\right)\left(\frac{63.55gCu}{1molCu}\right) = 44.18\text{ kg of copper should be produced}$
   c. $127.6\text{ kg CuFeS}_2\left(\frac{1molCuFeS_2}{183.54gCuFeS_2}\right)\left(\frac{5O_2}{2CuFeS_2}\right)\left(\frac{32gO_2}{1molO_2}\right) = 55.62\text{ kg of oxygen needed to go with the CuFeS}_2$