Name_____ Date_____

Mass-to-Mass Stoichiometry Worksheet #1

In the following problems, calculate how much of the indicated product is made. Show all of your work.

1) If 20.0 g of magnesium react with excess hydrochloric acid, how many grams of magnesium chloride will be produced?

20.0 g ? g

$Mg + 2HCl \rightarrow MgCl_2 + H_2$

$$\frac{95.21\ g\ MgCl_2}{1\ mol\ MgCl_2} \left| \frac{1\ mol\ MgCl_2}{1\ mol\ Mg} \right| \frac{1\ mol\ Mg}{24.31\ g\ Mg} \left| 20.0\ g\ Mg \right. = \boxed{78.3\ g\ MgCl_2}$$

2) How many grams of aluminum would be required to produce 550 g Fe using the following reaction?

? g 550 g

$2Al + Fe_2O_3 \rightarrow 2Fe + Al_2O_3$

$$\frac{26.98\ g\ Al}{1\ mol\ Al} \left| \frac{2\ mol\ Al}{2\ mol\ Fe} \right| \frac{1\ mol\ Fe}{55.85\ g\ Fe} \left| 550\ g\ Fe \right. = \boxed{270\ g\ Al}$$

3) If excess ammonium sulfate reacts with 20.0 g of calcium hydroxide, how many grams of ammonia are produced?

20.0 g ? g

$(NH_4)_2SO_4 + Ca(OH)_2 \rightarrow CaSO_4 + 2NH_3 + 2H_2O$

$$\frac{17.04\ g\ NH_3}{1\ mol\ NH_3} \left| \frac{2\ mol\ NH_3}{1\ mol\ Ca(OH)_2} \right| \frac{1\ mol\ Ca(OH)_2}{74.10\ g\ Ca(OH)_2} \left| 20.0\ g\ Ca(OH)_2 \right. = \boxed{9.20\ g\ NH_3}$$

4) How many grams of sodium hydroxide are needed to completely react with 25.0 g of sulfuric acid in the following reaction?

? g 25.0 g

$2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

$$\frac{40.00\ g\ NaOH}{1\ mol\ NaOH} \left| \frac{2\ mol\ NaOH}{1\ mol\ H_2SO_4} \right| \frac{1\ mol\ H_2SO_4}{98.09\ g\ H_2SO_4} \left| 25.0\ g\ H_2SO_4 \right. = \boxed{20.4\ g\ NaOH}$$

5) What mass of oxygen is needed to completely react with 84.9 g of Fe according to the following reaction?

84.9 g ? g

$4\,Fe + 3O_2 \rightarrow 2Fe_2O_3$

$$\frac{32.00\ g\ O_2}{1\ mol\ O_2} \left| \frac{3\ mol\ O_2}{4\ mol\ Fe} \right| \frac{1\ mol\ Fe}{55.85\ g\ Fe} \left| \frac{84.9\ g\ Fe}{} \right. = \boxed{36.5\ g\ O_2}$$

6) Sodium oxide reacts with water to produce sodium hydroxide. What mass of sodium oxide must be used to produce 275 grams of sodium hydroxide?

(+1 on Na, −2 on O)

? g 275 g

$Na_2O + H_2O \rightarrow 2NaOH$

$$\frac{61.98\ g\ Na_2O}{1\ mol\ Na_2O} \left| \frac{1\ mol\ Na_2O}{2\ mol\ NaOH} \right| \frac{1\ mol\ NaOH}{40.00\ g\ NaOH} \left| \frac{275\ g\ NaOH}{} \right. = \boxed{213\ g\ Na_2O}$$

7) When butane, C_4H_{10}, burns in oxygen, the products are carbon dioxide and water. What mass of carbon dioxide will be produced when 4.42 g of butane is burned in excess oxygen?

4.42 g ? g

$2C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O$

$$\frac{44.01\ g\ CO_2}{1\ mol\ CO_2} \left| \frac{8\ mol\ CO_2}{2\ mol\ C_4H_{10}} \right| \frac{1\ mol\ C_4H_{10}}{58.14\ g\ C_4H_{10}} \left| \frac{4.42\ g\ C_4H_{10}}{} \right. = \boxed{13.4\ g\ CO_2}$$