Worksheet: Mass/Mass Problems **Name** KEY

1. Nitrogen and hydrogen react to form ammonia gas according to the following equation.

$$\_\_\_N_2 + \_\_3\_H_2 \rightarrow \_\_2\_NH_3$$

a. If 56.0 grams of nitrogen are used up by the reaction, how many grams of ammonia will be produced?

$$?\ g\ NH_3 = 56.0\ \cancel{g\ N_2} \times \frac{1\ \cancel{mol\ N_2}}{28.0\ \cancel{g\ N_2}} \times \frac{2\ \cancel{mol\ NH_3}}{1\ \cancel{mol\ N_2}} \times \frac{17.0\ g\ NH_3}{1\ \cancel{mol\ NH_3}} = 68.0\ g\ NH_3$$

b. How many grams of hydrogen must react if the reaction needs to produce 63.5 grams of ammonia?

$$?\ g\ H_2 = 63.5\ \cancel{g\ NH_3} \times \frac{1\ \cancel{mol\ NH_3}}{17.0\ \cancel{g\ NH_3}} \times \frac{3\ \cancel{mol\ H_2}}{2\ \cancel{mol\ NH_3}} \times \frac{2.0\ g\ H_2}{1\ \cancel{mol\ H_2}} = 11\ g\ H_2$$

2. Aluminum metal reacts with zinc chloride to produce zinc metal and aluminum chloride.

$$\_\_2\_Al + \_\_3\_ZnCl_2 \rightarrow \_\_3\_Zn + \_\_2\_AlCl_3$$

a. A mass of 45.0 grams of aluminum will react with how many grams of zinc chloride?

$$?\ g\ ZnCl_2 = 45.0\ \cancel{g\ Al} \times \frac{1\ \cancel{mol\ Al}}{27.0\ \cancel{g\ Al}} \times \frac{3\ \cancel{mol\ ZnCl_2}}{2\ \cancel{mol\ Al}} \times \frac{136.4\ g\ ZnCl_2}{1\ \cancel{mol\ ZnCl_2}} = 341\ g\ ZnCl_2$$

b. What mass of aluminum chloride will be produced if 22.6 grams of zinc chloride are used up in the reaction?

$$?\ g\ AlCl_3 = 22.6\ \cancel{g\ ZnCl_2} \times \frac{1\ \cancel{mol\ ZnCl_2}}{136.4\ \cancel{g\ ZnCl_2}} \times \frac{2\ \cancel{mol\ AlCl_3}}{3\ \cancel{mol\ ZnCl_2}} \times \frac{133.5\ g\ AlCl_3}{1\ \cancel{mol\ AlCl_3}} = 14.7\ g\ AlCl_3$$

3. For the reaction whose balanced equation is as follows, find the number of grams of I_2 that will be formed when 300.0 g of bromine react.

$$2\ KI + Br_2 \rightarrow 2\ KBr + I_2$$

$$?\ g\ I_2 = 300.0\ \cancel{g\ Br_2} \times \frac{1\ \cancel{mol\ Br_2}}{159.8\ \cancel{g\ Br_2}} \times \frac{1\ \cancel{mol\ I_2}}{1\ \cancel{mol\ Br_2}} \times \frac{253.8\ g\ I_2}{1\ \cancel{mol\ I_2}} = 476.5\ g\ I_2$$

4. For the reaction whose balanced equation is as follows, find the number of grams of sodium that must react to produce 42.0 grams of sodium oxide.

$$4\ Na + O_2 \rightarrow 2\ Na_2O$$

$$?\ g\ Na = 42.0\ \cancel{g\ Na_2O} \times \frac{1\ \cancel{mol\ Na_2O}}{62.0\ \cancel{g\ Na_2O}} \times \frac{4\ \cancel{mol\ Na}}{2\ \cancel{mol\ Na_2O}} \times \frac{23.0\ g\ Na}{1\ \cancel{mol\ Na}} = 31.2\ g\ Na$$

5. For the reaction whose balanced equation is as follows, find how many grams of zinc phosphate will be produced by the reaction of 5.00 grams of ammonium phosphate.

$$3\ ZnCl_2 + 2\ (NH_4)_3PO_4 \rightarrow Zn_3(PO_4)_2 + 6\ NH_4Cl$$

$$?\ g\ Zn_3(PO_4)_2 = 5.00\ \cancel{g\ (NH_4)_3PO_4} \times \frac{1\ \cancel{mol\ (NH_4)_3PO_4}}{149.0\ \cancel{g\ (NH_4)_3PO_4}} \times \frac{1\ \cancel{mol\ Zn_3(PO_4)_2}}{2\ \cancel{mol\ (NH_4)_3PO_4}}$$

$$\times \frac{386.2\ g\ Zn_3(PO_4)_2}{1\ \cancel{mol\ Zn_3(PO_4)_2}} = 6.48\ g\ Zn_3(PO_4)_2$$