Worksheet: Mixed Problems—Mole/Mole and Mole/Mass **Name** KEY

Answer each of the following questions using the equation provided. BE SURE TO BALANCE EACH EQUATION BEFORE SOLVING ANY PROBLEMS. SHOW ALL WORK.

1. _2_Cu + ___O_2 → _2_CuO

a. If 101 grams of copper is used, how many moles of copper (II) oxide will be formed?

$$? \text{ mol CuO} = 101 \text{ g Cu} \times \frac{1 \text{ mol Cu}}{63.5 \text{ g Cu}} \times \frac{2 \text{ mol CuO}}{2 \text{ mol Cu}} = 1.59 \text{ mol CuO}$$

b. If 5.25 moles of copper are used, how many moles of oxygen must also be used?

$$? \text{ mol } O_2 = 5.25 \text{ mol Cu} \times \frac{1 \text{ mol } O_2}{2 \text{ mol Cu}} = 2.63 \text{ mol } O_2$$

c. If 78.2 grams of oxygen react with copper, how many moles of copper (II) oxide will be produced?

$$? \text{ mol CuO} = 78.2 \text{ g } O_2 \times \frac{1 \text{ mol } O_2}{32.0 \text{ g } O_2} \times \frac{2 \text{ mol CuO}}{1 \text{ mol } O_2} = 4.89 \text{ mol CuO}$$

2. _2_C_4H_{10} + _13_O_2 → _8_CO_2 + _10_H_2O

a. How many moles of butane, C_4H_{10}, are needed to react with 5.5 moles of oxygen?

$$? \text{ mol } C_4H_{10} = 5.5 \text{ mol } O_2 \times \frac{2 \text{ mol } C_4H_{10}}{13 \text{ mol } O_2} = 0.85 \text{ mol } C_4H_{10}$$

b. How many grams of carbon dioxide will be produced if 3.5 moles of O_2 react?

$$? \text{ g } CO_2 = 3.5 \text{ mol } O_2 \times \frac{8 \text{ mol } CO_2}{13 \text{ mol } O_2} \times \frac{44.0 \text{ g } CO_2}{1 \text{ mol } CO_2} = 95 \text{ g } CO_2$$

3. ___Mg + __2__HCl → ___$MgCl_2$ + ___H_2

a. What mass of HCl is consumed by the reaction of 2.50 moles of magnesium?

$$? \text{ g HCl} = 2.50 \text{ ~~mol Mg~~} \times \frac{2 \text{ ~~mol HCl~~}}{1 \text{ ~~mol Mg~~}} \times \frac{36.5 \text{ g HCl}}{1 \text{ ~~mol HCl~~}} = 183 \text{ g HCl}$$

b. What mass of $MgCl_2$ is produced if 3.67 moles of HCl react?

$$? \text{ g } MgCl_2 = 3.67 \text{ ~~mol HCl~~} \times \frac{1 \text{ ~~mol } MgCl_2\text{~~}}{2 \text{ ~~mol HCl~~}} \times \frac{95.3 \text{ g } MgCl_2}{1 \text{ ~~mol } MgCl_2\text{~~}} = 175 \text{ g } MgCl_2$$

c. How many moles of hydrogen gas are produced when 3.0 moles of magnesium react?

$$? \text{ mol } H_2 = 3.0 \text{ ~~mol Mg~~} \times \frac{1 \text{ mol } H_2}{1 \text{ ~~mol Mg~~}} = 3.0 \text{ mol } H_2$$

4. __4__NH_3 + __3__O_2 → __2__N_2 + __6__H_2O

a. How many moles of oxygen react with 0.23 moles of NH_3?

$$? \text{ mol } O_2 = 0.23 \text{ ~~mol } NH_3\text{~~} \times \frac{3 \text{ mol } O_2}{4 \text{ ~~mol } NH_3\text{~~}} = 0.17 \text{ mol } O_2$$

b. How many grams of water will be produced if 0.55 moles of oxygen react?

$$? \text{ g } H_2O = 0.55 \text{ ~~mol } O_2\text{~~} \times \frac{6 \text{ ~~mol } H_2O\text{~~}}{3 \text{ ~~mol } O_2\text{~~}} \times \frac{18.0 \text{ g } H_2O}{1 \text{ ~~mol } H_2O\text{~~}} = 20. \text{ g } H_2O$$

c. How many moles of nitrogen gas will be produced if 12.6 grams of ammonia react?

$$? \text{ mol } N_2 = 12.6 \text{ ~~g } NH_3\text{~~} \times \frac{1 \text{ ~~mol } NH_3\text{~~}}{17.0 \text{ ~~g } NH_3\text{~~}} \times \frac{2 \text{ mol } N_2}{4 \text{ ~~mol } NH_3\text{~~}} = 0.371 \text{ mol } N_2$$