Supplemental Stoichiometry Practice Problems

For each of the following, balance the chemical equation and then solve the corresponding question.

1. ___ $CaCl_2$ + ___ $Ag\,NO_3$ → ___ $Ca(NO_3)_2$ + ___ $AgCl$
   How many grams of AgCl are produced when 45 g of $CaCl_2$ react with excess silver nitrate?

2. ___ CuO + ___ H_2 → ___Cu + ___H_2O
   AT STP, how many liters of hydrogen gas are needed to react with 88 g of copper (II) oxide?

3. ___ Na + ___ H_2O → ___ $NaOH$ + ___ H_2
   If 3 liters of hydrogen gas (at STP) is produced by the above reaction, what mass of sodium was used?

4. ___ CH_4 + ___ O_2 → ___CO_2 + ___ H_2O
   What volume of methane is needed to react completely with 500 liters of oxygen gas?

5. ___ Cu + ___ $AgNO_3$ → ___$Cu(NO_3)_2$ + ___ Ag
   How many grams of silver will be produced if 86 g of copper are used?

Solve each of the following problems using your knowledge of chemistry.

6. Given the balanced chemical equation: $Br_2 + 2\ NaI \rightarrow 2\ NaBr + I_2$
   How many moles of sodium bromide could be produced from the reaction of 0.172 mol Br_2?

7. Aluminum metal reacts with sulfur to produce aluminum sulfide according to the equation:
   $2\ Al\ (s) + 3\ S\ (s) \rightarrow Al_2S_3\ (s)$
   Determine the mass in grams of sulfur needed to react with 0.65 mol aluminum metal.

8. The compound diborane (B_2H_6) was at one time considered for use as rocket fuel. How many grams of liquid oxygen would a rocket have to carry to burn 10000.g of diborane completely?
   $B_2H_6 + 3\ O_2 \rightarrow B_2O_3 + 3\ H_2O$

Supplemental Stoichiometry Practice Problems

$CaCl_2$ For each of the following, balance the chemical equation and then solve the corresponding question.

1×40.08 = 40.08
2×35.45 = 70.90
110.98g

___ $CaCl_2$ + 2 $AgNO_3$ → ___ $Ca(NO_3)_2$ + 2 AgCl

How many grams of AgCl are produced when 45 g of $CaCl_2$ react with excess silver nitrate?

AgCl
Ag 107.87
Cl 35.45
143.32

g $CaCl_2$ → mol $CaCl_2$ → mol AgCl → g AgCl

$$45\text{g } CaCl_2\left(\frac{1\text{ mol } CaCl_2}{110.98\text{g } CaCl_2}\right)\left(\frac{2\text{ mol AgCl}}{1\text{ mol } CaCl_2}\right)\left(\frac{143.32\text{g}}{1\text{ mol AgCl}}\right) = 116.226347$$

120 g AgCl

2. 1 CuO + 1 H_2 → 1 Cu + 1 H_2O

AT STP, how many liters of hydrogen gas are needed to react with 88 g of copper (II) oxide?

CuO
Cu 63.55
O 16.00
79.55

g CuO → mol CuO → mol H_2 → L H_2

$$88\text{g CuO}\left(\frac{1\text{ mol CuO}}{79.55\text{g CuO}}\right)\left(\frac{1\text{ mol } H_2}{1\text{ mol CuO}}\right)\left(\frac{22.4\text{ L}}{1\text{ mol } H_2}\right) = 24.77938$$

25 L H_2

3. 2 Na + 2 H_2O → 2 NaOH + ___ H_2

If 3 liters of hydrogen gas (at STP) is produced by the above reaction, what mass of sodium was used?

L H_2 → mol H_2 → mol Na → g Na

$$3\text{ L } H_2\left(\frac{1\text{ mol } H_2}{22.4\text{ L } H_2}\right)\left(\frac{2\text{ mol Na}}{1\text{ mol } H_2}\right)\left(\frac{23.00\text{g Na}}{1\text{ mol Na}}\right) = 6.1580357$$

6g Na

4. ___ CH_4 + 2 O_2 → ___ CO_2 + 2 H_2O

What volume of methane is needed to react completely with 500 liters of oxygen gas?

L O_2 → mol O_2 → mol CH_4 → L CH_4

$$500\text{ L } O_2\left(\frac{1\text{ mol } O_2}{22.4\text{ L } O_2}\right)\left(\frac{1\text{ mol } CH_4}{2\text{ mol } O_2}\right)\left(\frac{22.4\text{ L } CH_4}{1\text{ mol } CH_4}\right) = \textbf{250 L } CH_4$$

5. ___ Cu + 2 $AgNO_3$ → ___ $Cu(NO_3)_2$ + 2 Ag

How many grams of silver will be produced if 86 g of copper are used?

g Cu → mol Cu → mol Ag → g Ag

$$86\text{g Cu}\left(\frac{1\text{ mol Cu}}{63.55\text{g Cu}}\right)\left(\frac{2\text{ mol Ag}}{1\text{ mol Cu}}\right)\left(\frac{107.87\text{g}}{1\text{ mol Ag}}\right) = 291.95$$

290 g Ag

Solve each of the following problems using your knowledge of chemistry.

6. Given the balanced chemical equation: $Br_2 + 2\,NaI \rightarrow 2\,NaBr + I_2$
How many moles of sodium bromide could be produced from the reaction of 0.172 mol Br_2?

mol Br_2 → mol NaBr

$$0.172 \text{ mol } Br_2 \left(\frac{2 \text{ mol NaBr}}{1 \text{ mol } Br_2}\right) = \boxed{0.344 \text{ mol NaBr}}$$

7. Aluminum metal reacts with sulfur to produce aluminum sulfide according to the equation:
$2\,Al\,(s) + 3\,S\,(s) \rightarrow Al_2S_3\,(s)$
Determine the mass in grams of sulfur needed to react with 0.65 mol aluminum metal.

mol Al → mol S → g S

$$0.65 \text{ mol Al} \left(\frac{3 \text{ mol S}}{2 \text{ mol Al}}\right)\left(\frac{32.07 \text{ g S}}{1 \text{ mol S}}\right) = 31.20825$$

$\boxed{31 \text{ g S}}$

8. The compound diborane (B_2H_6) was at one time considered for use as rocket fuel. How many grams of liquid oxygen would a rocket have to carry to burn 10000. g of diborane completely?
$B_2H_6 + 3\,O_2 \rightarrow B_2O_3 + 3\,H_2O$

g B_2H_6 → mol B_2H_6 → mol O_2 → g O_2

B_2H_6

B $2 \times 10.81 = 21.62$
H $6 \times 1.01 = 6.06$
27.68

$$10000 \text{ g } B_2H_6 \left(\frac{1 \text{ mol } B_2H_6}{27.68 \text{ g } B_2H_6}\right)\left(\frac{3 \text{ mol } O_2}{1 \text{ mol } B_2H_6}\right)\left(\frac{32.00 \text{ g}}{1 \text{ mol } O_2}\right) =$$

34682.08092

$\boxed{34682 \text{ g } O_2}$