Name:

Stoichiometry Worksheet

1. Na_2SIO_3 (s) + 8 HF(aq) → H_2SiF_6 (aq) + 2 NaF(aq) + 3 H_2O (l)

a. How many moles of HF are needed to react with 0.300 mol of Na_2SiO_3?

$$0.300\,mol\ Na_2SiO_3 \times \frac{8\,mol\ HF}{1\,mol\ Na_2SiO_3} = 2.40\,mol\ HF$$

b. How many grams of NaF form when 0.500 mol of HF reacts with excess Na_2SiO_3?

$$0.500\,mol\ HF \times \frac{2\,NaF}{8\,mol\ HF} \times \frac{41.99\,g\ NaF}{1\,mol\ NaF} = 5.25\,g\ NaF$$

c. How many grams of Na_2SiO_3 can react with 0.800 g of HF?

$$0.800\,g\ HF \times \frac{1\,mol\ HF}{19.9\,g\ HF} \times \frac{1\,mol\ Na_2SiO_3}{8\,mol\ HF} \times \frac{122\,g\ Na_2SiO_3}{1\,mol\ Na_2SiO_3} = 0.613\,g\ Na_2SiO_3$$

2. $C_6H_{12}O_6$ (aq) → 2 C_2H_5OH (aq) + 2 CO_2 (g)

a. How many moles of CO_2 are produced when 0.400 mol of $C_6H_{12}O_6$ reacts in this fashion?

$$.400\,mol\ C_6H_{12}O_6 \times \frac{2\,mol\ CO_2}{1\,mol\ C_6H_{12}O_6} = .800\,mol\ CO_2$$

b. How many grams of $C_6H_{12}O_6$ are needed to form 7.50 g of C_2H_5OH?

$$7.50\,g\ C_2H_5OH \times \frac{1\,mol\ C_2H_5OH}{46.1\,g\ C_2H_5OH} \times \frac{1\,mol\ C_6H_{12}O_6}{2\,mol\ C_2H_5OH} \times \frac{180.\,g\ C_6H_{12}O_6}{1\,mol\ C_6H_{12}O_6} = 14.7\,g\ C_6H_{12}O_6$$

c. How many grams of CO_2 form when 7.50 g of C_2H_5OH are produced?

$$7.60\,g\ C_2H_5OH \times \frac{1\,mol\ C_2H_5OH}{46.1\,g\ C_2H_5OH} \times \frac{2\,mol\ CO_2}{2\,mol\ C_2H_5OH} \times \frac{44.0\,g\ CO_2}{1\,mol\ CO_2} = 7.16\,g\ CO_2$$

3. Fe_2O_3 (s) + 3 CO (g) → 2 Fe(s) + 3 CO_2 (g) (unbalanced!)

K h da u d e m

a. Calculate the number of grams of CO that can react with 0.150 kg of Fe_2O_3

$$0.150\,Kg\ Fe_2O_3 \times \frac{1000\,g\ Fe_2O_3}{1\,Kg} \times \frac{1\,mol\ Fe_2O_3}{159.7\,g\ Fe_2O_3} \times \frac{3\,mol\ CO}{1\,mol\ Fe_2O_3} \times \frac{28.01\,g\ CO}{1\,mol\ CO} = 78.9\,g\ CO$$

b. Calculate the number of grams of Fe and the number of grams of CO_2 formed when 0.150 kg of Fe_2O_3 reacts

150 g

$150\text{g } Fe_2O_3 \times \frac{1\text{ mol}}{159.7\text{ g } Fe_2O_3} \times \frac{3\text{ mol } CO_2}{1\text{ mol } Fe_2O_3} \times \frac{44.0\text{g } CO_2}{1\text{ mol } CO_2} = 124\text{g } CO_2$

$150\text{g } Fe_2O_3 \times \frac{1\text{ mol } Fe_2O_3}{159.7\text{ g } Fe_2O_3} \times \frac{2\text{ mol Fe}}{1\text{ mol } Fe_2O_3} \times \frac{55.85\text{ g Fe}}{1\text{ mol Fe}} = 105\text{g Fe}$

* 4. $2\,NaOH\,(s) + CO_2\,(g) \rightarrow Na_2CO_3\,(s) + H_2O\,(l)$

a. Which reagent is the limiting reactant when 1.85 mol NaOH and 1.00 mol CO_2 are allowed to react? pg 370

$\frac{\text{moles of reagent}}{\text{coefficient of reagent}}$

$\frac{1.85\text{ mol NaOH}}{2} = .925\text{ mol NaOH}$ $\qquad \frac{1.00\text{ mol } CO_2}{1} = 1.00\text{ mol } CO_2$

L.R. = NaOH

b. How many moles of Na_2CO_3 can be produced?

$1.85\text{ mol NaOH} \times \frac{1\text{ mol } Na_2CO_3}{2\text{ mol NaOH}} = .925\text{ mol } Na_2CO_3$

* 5. $C_6H_6 + Br_2 \rightarrow C_6H_5Br + HBr$

a. What is the theoretical yield of C_6H_5Br in this reaction when 30.0 g of C_6H_6 reacts with 65.0 g of Br_2?

$30\text{g } C_6H_6 \times \frac{1\text{ mol } C_6H_6}{78.12\text{g } C_6H_6} = 0.384\text{ mol } C_6H_6 / 1 = .384$

$65.0\text{g } Br_2 \times \frac{1\text{ mol } Br_2}{159.8\text{g } Br_2} = 0.4067 / 1 = 0.407$

$30\text{g } C_6H_6 \times \frac{1\text{ mole}}{78.12\text{g } C_6H_6} \times \frac{1\text{ mol}}{1\text{ mol}} \times \frac{157.0\text{g}}{1\text{ mol } C_6H_5Br} = 60.3\text{ g}$

b. If the actual yield of C_6H_5Br was 56.7 g, what is the percent yield?

$\frac{56.7}{60.3} \times 100 = 94\%$