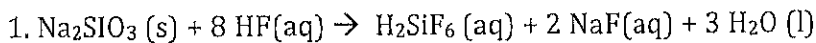


KEY

Stoichiometry Worksheet



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

$$? \text{ HF} = 0.3 \text{ mol Na}_2\text{SiO}_3 \times \frac{8 \text{ mol HF}}{1 \text{ mol Na}_2\text{SiO}_3} = \boxed{2.40 \text{ mol HF}}$$

b. How many grams of NaF form when 0.500 mol of HF reacts with excess Na_2SiO_3 ? a) mol \rightarrow mol \rightarrow g

$$? \text{ g NaF} = 0.500 \text{ mol HF} \rightarrow \text{mol NaF} \rightarrow \text{g NaF}$$

$$= 0.500 \text{ mol HF} \times \frac{2 \text{ mol NaF}}{8 \text{ mol HF}} = 0.125 \text{ mol NaF} \times \frac{41.99 \text{ g NaF}}{1 \text{ mol NaF}} =$$

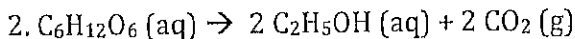
$$\text{NaF} = 41.99 \text{ g/mol} \quad \boxed{5.24 \text{ g NaF}}$$

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

$$\text{Na}_2\text{SiO}_3 = 122.07 \text{ g/mol} \quad \text{a) g} \rightarrow \text{mol} \rightarrow \text{mol} \rightarrow \text{g problem.}$$

$$? \text{ g Na}_2\text{SiO}_3 = 0.800 \text{ g HF} \rightarrow \text{mol HF} \rightarrow \text{mol Na}_2\text{SiO}_3 \rightarrow \text{g Na}_2\text{SiO}_3$$

$$0.800 \text{ g HF} \times \frac{1 \text{ mol HF}}{20.1 \text{ g HF}} \times \frac{1 \text{ mol Na}_2\text{SiO}_3}{8 \text{ mol HF}} \times \frac{122.07 \text{ g Na}_2\text{SiO}_3}{1 \text{ mol Na}_2\text{SiO}_3} = \boxed{0.607 \text{ g Na}_2\text{SiO}_3}$$



a. How many moles of CO_2 are produced when 0.400 mol of $\text{C}_6\text{H}_{12}\text{O}_6$ reacts in this fashion?

$$? \text{ mol CO}_2 = 0.400 \text{ mol C}_6\text{H}_{12}\text{O}_6 \times \frac{2 \text{ mol CO}_2}{1 \text{ mol C}_6\text{H}_{12}\text{O}_6} = \boxed{0.800 \text{ mol CO}_2}$$

b. How many grams of $\text{C}_6\text{H}_{12}\text{O}_6$ are needed to form 7.50 g of $\text{C}_2\text{H}_5\text{OH}$? \rightarrow g problem.

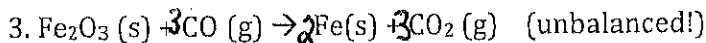
$$? \text{ g C}_6\text{H}_{12}\text{O}_6 = 7.50 \text{ g C}_2\text{H}_5\text{OH} \rightarrow \text{g problem.}$$

$$? \text{ g C}_6\text{H}_{12}\text{O}_6 = 7.50 \text{ g C}_2\text{H}_5\text{OH} \times \frac{1 \text{ mol C}_2\text{H}_5\text{OH}}{46.08 \text{ g C}_2\text{H}_5\text{OH}} \times \frac{1 \text{ C}_6\text{H}_{12}\text{O}_6}{2 \text{ C}_2\text{H}_5\text{OH}} \times \frac{180.18 \text{ g C}_6\text{H}_{12}\text{O}_6}{1 \text{ mol}} =$$

$$\boxed{14.7 \text{ g C}_6\text{H}_{12}\text{O}_6}$$

c. How many grams of CO_2 form when 7.50 g of $\text{C}_2\text{H}_5\text{OH}$ are produced?

$$7.50 \text{ g C}_2\text{H}_5\text{OH} \times \frac{1 \text{ mol C}_2\text{H}_5\text{OH}}{46.08 \text{ g C}_2\text{H}_5\text{OH}} \times \frac{2 \text{ CO}_2}{2 \text{ C}_2\text{H}_5\text{OH}} = \boxed{7.16 \text{ g CO}_2}$$



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

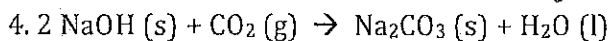
$$0.150 \text{ kg Fe}_2\text{O}_3 = 150 \text{ g Fe}_2\text{O}_3 \times \frac{1 \text{ mol Fe}_2\text{O}_3}{159.70 \text{ g Fe}_2\text{O}_3} \times \frac{3 \text{ CO}}{1 \text{ Fe}_2\text{O}_3} \times \frac{28.01 \text{ g CO}}{1 \text{ mol CO}} =$$

$$\boxed{78.9 \text{ g CO}}$$

b. Calculate the number of grams of Fe and the number of grams of CO₂ formed when 0.150 kg of Fe₂O₃ reacts

$$\textcircled{1} \quad 150 \text{ g Fe}_2\text{O}_3 \times \frac{1 \text{ mol Fe}_2\text{O}_3}{159.70 \text{ g Fe}_2\text{O}_3} = 0.939 \text{ mol Fe}_2\text{O}_3 \times \frac{3 \text{ mol CO}_2}{1 \text{ mol Fe}_2\text{O}_3} \times \frac{44.01 \text{ g CO}_2}{1 \text{ mol CO}_2} = 124 \text{ g CO}_2$$

$$\textcircled{2} \quad 0.939 \text{ mol Fe}_2\text{O}_3 \times \frac{2 \text{ mol Fe}}{1 \text{ mol Fe}_2\text{O}_3} \times \frac{55.85 \text{ g Fe}}{1 \text{ mol Fe}} = 105 \text{ g Fe}$$

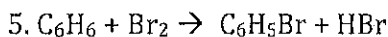


a. Which reagent is the limiting reactant when 1.85 mol NaOH and 1.00 mol CO₂ are allowed to react?

$\frac{2 \text{ mol NaOH}}{1 \text{ mol CO}_2}$ because $\frac{1.85 \text{ mol NaOH}}{1 \text{ mol CO}_2}$ is too small a ratio,
NaOH is the limiting reactant

b. How many moles of Na₂CO₃ can be produced?

$$1.85 \text{ mol NaOH} \times \frac{1 \text{ mol Na}_2\text{CO}_3}{2 \text{ mol NaOH}} = 0.925 \text{ mol Na}_2\text{CO}_3$$



a. What is the theoretical yield of C₆H₅Br in this reaction when 30.0 g of C₆H₆ reacts with 65.0 g of Br₂?

$$\textcircled{a) \quad 30.0 \text{ g C}_6\text{H}_6 \times \frac{1 \text{ mol C}_6\text{H}_6}{78.12 \text{ g C}_6\text{H}_6} \times \frac{1 \text{ mol C}_6\text{H}_5\text{Br}}{1 \text{ mol C}_6\text{H}_6} \times \frac{157.01 \text{ g C}_6\text{H}_5\text{Br}}{1 \text{ mol C}_6\text{H}_5\text{Br}} = 60.3 \text{ g C}_6\text{H}_5\text{Br}$$

$$\textcircled{b) \quad 65.0 \text{ g Br}_2 \times \frac{1 \text{ mol Br}_2}{159.8 \text{ g Br}_2} \times \frac{1 \text{ mol C}_6\text{H}_5\text{Br}}{1 \text{ mol Br}_2} \times \frac{157.01 \text{ g C}_6\text{H}_5\text{Br}}{1 \text{ mol C}_6\text{H}_5\text{Br}} = 63.9 \text{ g C}_6\text{H}_5\text{Br}$$

The smallest value is the answer.

This is the theoretical yield.

The limiting reactant is C₆H₆. Br₂ is in excess.

b. If the actual yield of C₆H₅Br was 56.7 g, what is the percent yield?

$$\frac{\text{actual}}{\text{theo.}} \times 100 = \% = \frac{56.7}{60.3} \times 100 = 94.0\% \text{ yield}$$

How much excess? 3.6 g Br₂ There are 2 ways to calc.

$$\textcircled{1} \quad 60.3 \text{ g C}_6\text{H}_5\text{Br} \times \frac{1 \text{ mol C}_6\text{H}_5\text{Br}}{157.01 \text{ g C}_6\text{H}_5\text{Br}} \times \frac{1 \text{ mol Br}_2}{1 \text{ mol C}_6\text{H}_5\text{Br}} \times \frac{159.8 \text{ g Br}_2}{1 \text{ mol Br}_2} = 61.4 \text{ g Br}_2 \text{ used}$$

$$\textcircled{2} \quad 65.0 - \left(65.0 \times \frac{60.3}{63.9} \right) = 3.6 \text{ g excess}$$

65g start - 61.4g used = 3.6g excess