Worksheet: Percent Yield Name Key

1. Chlorobenzene, C_6H_5Cl, is used in the production of chemicals such as aspirin and dyes. One way that chlorobenzene is prepared is by reacting benzene, C_6H_6, with chlorine gas according to the following BALANCED equation.

C_6H_6 : 6C + 6H
$6(12.01)+6(1.008)=\frac{78.10}{1\text{ m}}$

C_6H_5Cl
$6(12.01)+5(1.008)+35.4$
$=\frac{112.55\text{ g}}{1\text{ mol}}$

$$\underset{45.6\text{ g}}{C_6H_6\ (l)} + Cl_2\ (g) \rightarrow \underset{x\text{ g}}{C_6H_5Cl\ (s)} + HCl\ (g)$$

a. What is the theoretical yield if 45.6 g of benzene react?

$$\frac{45.6\text{ g } C_6H_6}{} \left| \frac{1\text{ mol } C_6H_6}{78.108\text{ g } C_6H_6} \right| \frac{1\text{ mol } C_6H_5Cl}{1\text{ mol } C_6H_6} \left| \frac{112.55\text{ g } C_6H_5Cl}{1\text{ mol } C_6H_5Cl} \right. = 65.7\text{ g } C_6H_5Cl$$

b. If the actual yield is 63.7 g of chlorobenzene, calculate the percent yield.

$$\%\text{ yield} = \frac{\text{actual}}{\text{theoretical}} \times 100 = \frac{63.7}{65.7} \times 100 = 97\%$$

2. When carbon disulfide burns in the presence of oxygen, sulfur dioxide and carbon dioxide are produced according to the following equation.

CS_2
$1(12.01)+2(32.07)$
$=76.15\text{ g}/1\text{ mol}$

SO_2
$1(32.07)+2(16)$
$=64.07\text{ g}/1\text{ m}$

$$\underset{25.0\text{ g}}{CS_2\ (l)} + \underset{2.5\text{ mol}}{3\ O_2\ (g)} \rightarrow \underset{x\text{ g}}{CO_2\ (g)} + \underset{x\text{ g}}{2\ SO_2\ (g)}$$

a. What is the percent yield of sulfur dioxide if the burning of 25.0 g of carbon disulfide produces 40.5 g of sulfur dioxide?

$$\frac{25.0\text{ g } CS_2}{} \left| \frac{1\text{ mol } CS_2}{76.15\text{ g } CS_2} \right| \frac{2\text{ mol } SO_2}{1\text{ mol } CS_2} \left| \frac{64.07\text{ g } SO_2}{1\text{ mol } SO_2} \right. = 42.1\text{ g } SO_2$$

$$\%\text{ yield} = 40.5/42.1 \times 100 = 96\%$$

b. What is the percent yield of carbon dioxide if 2.5 mol of oxygen react and 32.4 g of carbon dioxide are produced?

CO_2 $1(12.01)+2(16)$
$=44.01\text{ g}/1\text{ mol}$

$$\frac{2.5\text{ mol } O_2}{} \left| \frac{1\text{ mol } CO_2}{3\text{ mol } O_2} \right| \frac{44.01\text{ g } CO_2}{1\text{ mol } CO_2} = 36.7\text{ g } CO_2$$

$$\%\text{ yield} \quad 32.4\text{ g}/36.7\text{ g} \times 100 = 88\%$$