

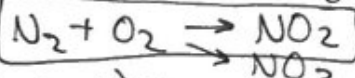
Percent Yield Notes

When we use stoichiometry to calculate the amount of product that can be produced from a specific amount of reactant in a chemical reaction, we are calculating the

Theoretical Yield *do math!*

* The Theoretical yield is the maximum amount of product that can be produced from a given amount of product reactant

However, in most chemical reactions the amount of product obtained is less than the theoretical yield. There are many reasons for this. Some of the reactants may be used in competing side reactions. In other words there may be more than one reaction taking place in the vessel. Reactions are not 100% efficient.



The measured amount of product obtained from a reaction is called the actual yield of that product.

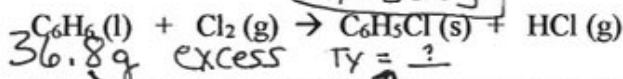
carry out the reaction

Chemists are interested in the efficiency of reactions. The efficiency is expressed by comparing the theoretical yield to the actual yield. The percent yield is the ratio of the actual yield to the theoretical yield, multiplied by 100.

$$\text{Percent Yield} = \frac{\text{actual yield}}{\text{theoretical yield}} \times 100$$

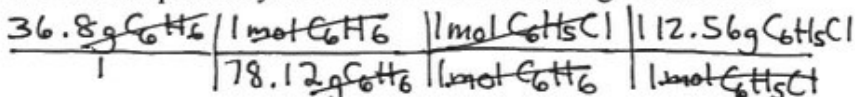
X

Example 1: Chlorobenzene, $\text{C}_6\text{H}_5\text{Cl}$, is used in the production of many important chemicals, such as aspirin, dyes and disinfectants. One industrial method of preparing chlorobenzene is to react benzene, C_6H_6 , with chlorine as below.



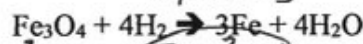
$$\%Y = \frac{38.8g}{53.0g} \times 100 = 73.2\%$$

When 36.8 g of C_6H_6 with an excess of Cl_2 , the actual yield of $\text{C}_6\text{H}_5\text{Cl}$ is 38.8 grams. What is the percent yield of chlorobenzene using this method?



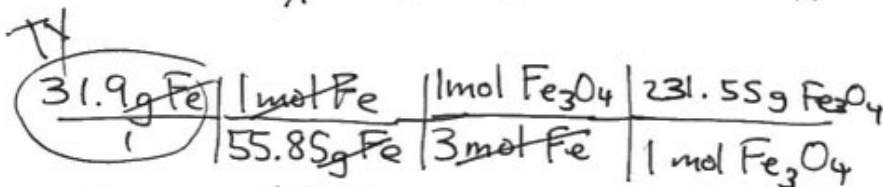
TY = 53.0g $\text{C}_6\text{H}_5\text{Cl}$

Example 2: The reaction below is known to have a 78.25 percent yield. How many grams of Fe_3O_4 should be used if 25.0 grams of iron must be produced? Assume that there is an unlimited supply of hydrogen gas.



AY = 25.0g

$$78.25\% = \frac{25.0g}{X} \times 100 \Rightarrow .7825 = \frac{25.0}{X} \Rightarrow .7825X = 25.0$$



X = 31.9g goal TY

check $\frac{25.0g}{31.9g} \times 100 = 78.3\%$

44.1g Fe_3O_4