Success 24/7 Chemistry: Limiting & Excess Reactant

In every reaction, the reactants are used to make the products. Eventually, a reactant will be used up and the reaction will end.

The reactant that is used up and causes the reaction to end, is called the **limiting reactant**. The limiting reactant determines how much product will be made.

Any other reactants that remain are called **excess reactants**.

IF your problem gives you two amounts of reactants and asks how much product will be formed, it is a "limiting reactant problem".

g: amount of reactant

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w: ? amount of product

The smallest amount produced will be your final answer…and the reactant that caused it will be your limiting reactant.

Ex 1: How many moles of potassium chloride will be produced from the reaction of 1.4 mol potassium with 3.1 mol chlorine?

$$K \quad + \quad Cl_2 \quad \rightarrow \quad KCl$$

To determine how much excess reactant will remain unused/unchanged:

g: original amount of limiting reactant

w: ? amount of excess reactant *(this will be the amount of excess reactant that was USED)*

Original amt. ER – Used amt. ER = Amt. ER remaining

How much excess reactant will remain in Ex. 1?

Ex 2: If 16.8 grams of copper is placed into a solution containing 25.65 g of silver nitrate, what mass of silver will be produced?

$$Cu \quad + \quad AgNO_3 \rightarrow \quad Cu(NO_3)_2 \quad + \quad Ag$$

Ex 3: What mass of water forms when solutions containing 3.27 g of hydrochloric acid and 7.62 g of calcium hydroxide are mixed? How much, in grams, of the reactant in excess remains unreacted?

HCl   +   Ca(OH)$_2$ →   CaCl$_2$ +   H$_2$O
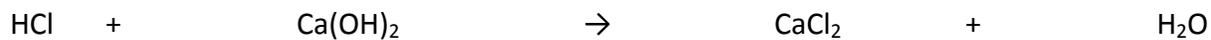
Ex 4: 37.4 g iron (II) chloride in solution was mixed with 42.3 g potassium permanganate in the presence of acid. The following reaction occurred:

$$5 \, FeCl_2 + KMnO_4 + 8 \, HCl \rightarrow 5 \, FeCl_3 + MnCl_2 + KCl + 4 \, H_2O$$

a) What mass of iron (III) chloride was produced?

b) What mass of the excess reactant was not used?