



Chemistry

Class-9

Chapter-6

Concept of mole and chemical counting

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Lecture sheet with worksheet-8

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Unit-1: Limiting reactant

When we react two substances, it's essentially impossible to have them in precisely the correct amounts for both of them to react completely. One of them will be the reactant in excess and other one of them will be the limiting reactant. The limiting reactant is the one that runs out first which makes reacting further impossible. The other reactant will then be in excess because there will be some left over. In order to identify which is the limiting reactant, we have to see which quantity will limit the reaction stoichiometrically and it won't automatically be the substance that is present in the lesser amount. Limiting reactant is not the reactant we have the least of. Instead, it is the first reactant to run out during the reaction. So, the total amount of product that we can make is completely dependent on the amount of limiting reactant. Limiting reactant produces the least amount of product.

Limiting reactant is the first reactant that is used up in a reaction. When the limiting reactant is all used up, no more product can form, and the reaction stops.

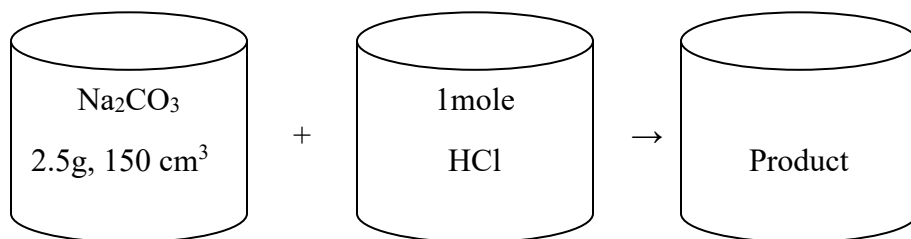
Excess reactant is what is left over after the reaction stops because the limiting reactant got all used up.

Theoretical yield is whatever the limiting reactant actually produces.

Exercise-1:

1. What is limiting reactant and excess reactant?
2. 75 g chlorine gas is mixed with 5 g hydrogen gas. Which is the limiting reactant here? How much of which reactant will be left over at the end of the reaction? What will be the theoretical yield of HCl?/ Calculate the amount of product in the reaction.
3. To prepare 325 g of calcium chloride 120 g of calcium and 205 g of chlorine is mixed. Which one is the limiting reactant of the reaction?

4.



Identify limiting reactant of given reaction & calculate number of carbon dioxide that formed in given reaction.

Unit-2: Percent yield/ percentage of yield

An important real-life limitation of chemistry is that the amount of product we calculate that we should get is actually just the theoretical yield. This is the amount of product we calculate which we can expect, if every molecule of reactant converts into product. But in reality, this does not occur. When we work in a lab and do a chemical reaction and expect to get the amount of product from stoichiometric calculations from balanced chemical equation, we get the actual yield after doing experiment that less than theoretical yield.

The reactants or chemical substances used in reactions are not 100% pure. The purest chemical substances or reactants which are 99% pure called analar. When the reactant is not 100% pure, the reaction does not yield the amount of product that is calculated from the amount of limiting reactant. Sometime this happens because of different types of error such as random error, systematic error and personal error.

The actual yield will always be some fraction of theoretical yield which called the percent yield.

$$\frac{\text{Amount of product obtained from reaction (Actual yield)}}{\text{Calculated amount of product from reaction (Theoretical yield)}} \times 100 = \% \text{ yield}$$

Percent yield is an important measure of the efficiency of a chemical reaction and is very useful in planning any synthesis of compound.

Exercise-2:

1. If 39g CaO is obtained by heating 80g CaCO₃, calculate the percent amount of the product.