

Chapter-01

Class –Xi

Sub- Chemistry

What is Limiting Reagents?

The reactant that is entirely used up in a reaction is called as limiting reagent.

Limiting reagents are the substances that are *completely consumed in the completion of a chemical reaction*. They are also referred to as limiting agents or limiting reactants. According to the stoichiometry of chemical reactions, a

fixed amount of reactants is required for the completion of the reaction. Let us consider the following reaction of formation of ammonia:



In the reaction given above, 3 moles of Hydrogen gas are required to react with 1 mole of nitrogen gas to form 2 moles of ammonia. But what if, during the reaction, only 2 moles of hydrogen gas are available along with 1 mole of nitrogen.

In that case, the entire quantity of nitrogen cannot be used (because the entirety of nitrogen requires 3 moles of hydrogen gas to react).

Hence, the hydrogen gas is limiting the reaction and is therefore called the limiting reagent for this reaction.

What is Mass per cent?

Mass per cent is a way of expressing a concentration or describing the component in a particular mixture. The solution composition can be described in mass percentage which shows the mass of solute present in a given mass of solution. The quantity of solute is expressed in mass or by moles. For a solution, the mass per cent is described as the grams of solute per grams of solution, multiplied by 100 to get the percentage.

Mass per cent Formula

The Mass per cent formula is expressed as solving for the molar mass also for the mass of each element in 1 mole of the compound. You can determine the mass percentage of each element with these masses.

What is Mole fraction?

Mole fraction represents the number of molecules of a particular component in a mixture divided by the total number of moles in the given mixture. It's a way of expressing the concentration of a solution.

Mole Fraction formula

The molar fraction can be represented by X. If the solution consists of components A and B, then the mole fraction is:-

$$X_A = n_A / n_A + n_B$$

$$X_B = n_B / n_A + n_B$$

Therefore, the sum of mole fraction of all the components is always equal to one.

Please note that mole fraction represents a fraction of molecules, and since different molecules have different masses, the mole fraction is different from the mass fraction.

Molarity

It is one of the most widely used unit of concentration and is denoted by M. It is defined as no. of moles of solute present in 1 liter of solution. Thus,

Molarity = No. of moles of solute/Volume of solution(in Litres)

Mass Per Cent or weight percent (w/w %)

It is the ratio of the mass of solute to the mass of solution multiplied by 100 to calculate mass percent. It is also known as weight percent and is represented by (w/w %). You may have seen this symbol on the back of

medicines and tablets. It is one of the most commonly used units of representing concentration.

Mathematically,

Mass percent =

Mass of solute/Mass of solution $\times 10$

Molality

It is defined as moles of solute present in 1-kilogram of solvent. It is denoted by m.

Molality, $m = \text{No. of moles of solute/Mass of solvent}$
(in kg)