# Chemistry Class 12 NCERT Solutions: Chapter 2 Solutions Part 5



Exercise: 2

Q: 1. Define the term solution. How many types of solutions are formed? Write briefly about each type with an example.

Answer:

Homogeneous mixtures of two or more than two components are known as solutions.

There are three types of solutions.

(i) Gaseous solution:

The solution in which the solvent is a gas is called a gaseous solution. In these solutions, the solute may be liquid, solid, or gas. For example, a mixture of oxygen and nitrogen gas is a gaseous solution.

(ii) Liquid solution:

The solution in which the solvent is a liquid is known as a liquid solution. The solute in these solutions may be gas, liquid, or solid. For example, a solution of ethanol in water is a liquid solution.

(iii) Solid solution:

The solution in which the solvent is a solid is known as a solid solution. The solute may be gas, liquid or solid. For example, a solution of copper in gold is a solid solution.

Q: 2. Give an example of solid solution in which the solute is a gas.

Answer:

In case a solid solution is formed between two substances (one having very large particles and the other having very small particles) , an interstitial solid solution will be formed. For example, a solution of hydrogen in palladium is a solid solution in which the solute is a gas.

Q3: Define the following terms:

(i) Mole fraction

(ii) Molality

(iii) Molarity

(iv) Mass percentage.

Answer:

(i) Mole fraction:

The mole fraction of a component in a mixture is defined as the ratio of the number of moles of the component to the total number of moles of all the components in the mixture.

$$\text{Mole fraction of a component} = \frac{\text{Number of moles of the component}}{\text{Total number of moles of all components}}$$

Mole fraction is denoted by $'x'$

If in a binary solution, the number of moles of the solute and the solvent are $n_A \text{and} n_B$ respectively, then the mole fraction of the solute in the solution is given by,

$$x_A = \frac{n_A}{n_A + n_B}$$

Similarly, the mole fraction of the solvent in the solution is given as:

$$x_B = \frac{n_B}{n_A + n_B}$$

(ii) Molality:

Molality (m) is defined as the number of moles of the solute per kilogram of the solvent. It is expressed as:

$$\text{Molality (m)} = \frac{\text{Moles of solute}}{\text{Mass of solvent in kg}}$$

(iii) Molarity:

Molarity (M) is defined as the number of moles of the solute dissolved in one Litre of the solution. It is expressed as:

$$\text{Molarity (M)} = \frac{\text{Moles of solute}}{\text{Volume of solution in Liter}}$$

(iv) Mass Percentage:

The mass percentage of a component of a solution is defined as the mass of the solute in grams present in 100 g of the solution. It is expressed as:

$$\text{Mass \% of a component} = \frac{\text{Mass of component in solution}}{\text{Total mass of solution}} \times 100$$

Q: 4. Concentrated nitric acid used in laboratory work is $68\%$ nitric acid by mass in aqueous solution. What should be the molarity of such a sample of the acid if the density of the solution is $1.504 gmL^{-1}$ ?

Molar mass of nitric acid $(HNO_3) = 1 \times 1 + 1 \times 14 + 3 \times 16 = 63 gmol^{-1}$

Then, number of moles of $HNO_3 = \frac{68}{63} mol$

$1.079\ mol$

Given Density of solution $= 1.504 gmL^{-1}$

$\therefore \text{Volume of} 100g \text{ solution} = \frac{100}{1.504} ml$

$= 66.49\ mL$

$= 66.49 \times 10^{-3}\ L$

$$\text{Molarity of solution} = \frac{1.079 mol}{66.49 \times 10^{-3} L}$$

$$= 16.23 M$$