

Chapter 2 : Solutions and mass concentration

I. What are the constituents of a solution ?

When one or several chemical species (solid, liquid or gaseous) dissolve in a liquid, we obtain an homogeneous mixture called solution.

The minority species are called **dissolved species**. The majority species, in which dissolved species are dissolved, is called the **solvent**.

If the solvent is water, we have an **aqueous solution**.

When the solvent cannot hold more dissolved species, the solution is **saturated**. The maximal quantity of solid which we can dissolve in a liter of solvent is called the **solubility**, it is expressed in g.L^{-1} . Its value depends on the temperature.

II. Mass concentration of a solution

1. Definition

The properties (taste, colour) of a solution depend not only on the mass of dissolved species which is there but also on the volume of the solution.

The mass concentration C_m of a solution is equal to the mass of solid dissolved by liter of solution. It is usually expressed in g.L^{-1} .

If a volume V of solution contains a mass m of a dissolved species, its mass concentration is :

$$C_m = \frac{m}{V}$$

m the mass in g
 V the volume in L
 C_m in g.L^{-1}

Exemple : A volume of $V = 2,00 \text{ mL}$ of blood plasma contains a mass $m = 0,200 \text{ mg}$ of calcium ions. What is the mass concentration C_m of calcium ions ?

Compare it to the usual boundaries for an adult, which are situated between $0,090$ and $0,105 \text{ g.L}^{-1}$.

2. Preparation of a solution by dissolution

It is important to know exactly the dose injected to patients. It is thus necessary to realize solutions of known mass concentration. If the medicine is a solid (powder), we realize a **dissolution**.

We wish to prepare a volume V of a solution of mass concentration C_m by dissolution of a species.

The mass to be dissolved is equal to :

$$m = C_m \times V$$

C_m in g.L^{-1}
 V in L
 m in g

The solution is prepared in a **gauged phial** which can contain a precise volume of liquid.