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:

\[
C_m = \frac{m}{V}
\]

Exemple : A volume of \(V = 2,00\) mL of blood plasma contains a mass \(m = 0,200\) 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 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:

\[
m = C_m \times V
\]

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