

TP N° 2: Solution Preparation, Dissolution and Dilution Method

1-Reminders:

-Definition of a solution: In chemistry, a solution is a mixture of two or more constituents. The major constituent is called **solvent**. The minority compound(s) are called **solute(s)**. One distinguishes between liquid, gaseous, or solid solutions.

-When the solvent is water, the solution is called an "**aqueous solution**".

- When the solvent can no longer hold any more solute, the solution is said to be "**saturated**".

-A solution can be prepared by:

-Dissolving a solid.

-Diluting a more concentrated liquid.

-Dissolution of a solid: A solid substance dissolves in a liquid when it comes into contact with it. It disappears into the liquid to form a homogeneous solution. Dissolution is a physical process, without any chemical reaction. However, it may be accompanied by a change in temperature.

-Dilution: it's a process that involves obtaining a solution with a concentration lower than that of the starting one. Diluting a solution means decreasing its concentration by adding distilled water. During dilution, the amount of solute material is retained .

The starting solution is called the '**mother solution**' and the diluted solution is called the '**daughter solution**'.

-Dilution factor: The **dilution** is characterized by its dilution rate, also called **dilution factor**. We call the coefficient dilution factor $k=C_i/C_f=V_f/V_i$

-Different expressions of concentration

We call the concentration of the solution the amount of solute contained in the unit of volume or mass of the solution. If a compound X is present in a solution, we can define the composition of the solution at X using:

-The mass concentration (the mass title $t [g.L^{-1}]$): It is the ratio of the mass (m) of compound X contained in a certain volume of solution (V) divided by this volume of solution

(V). Mass is expressed in kg or g and volume often expressed in L and sometimes in m^3 .

- **The molar concentration (Molarity $C [mol.L^{-1}]$):** It is the amount of material of X contained in one liter of the solution. The molar concentration is expressed in $mol.L^{-1}$.

- **The normal concentration (Normality $N [eq.L^{-1}]$):** It is the number of gram equivalent of solute contained in one liter of solution (V).

2-Purpose of TP: the purpose of this manipulation is to know how to prepare a concentration solution given by dissolution of a solid and dilution of a mother solution.

3- Materials and reagents used

Materials:

-Electronic balance

-Volumetric flasks of 250 mL and 100ML

-Beaker

-Pipet

-Watch glass, spatula

Reagents:

-Distilled water

-Sodium chloride NaCl (M=58.5g/mol)

4- Procedure: dissolution protocol

1-Place an empty watch glass on the plate of a scale, then press the tare or zero button and reach the display: 0.0g.

2- Using a spatula, take a little sodium chloride (salt) until reaching the desired mass $m_1=3\text{g}$.

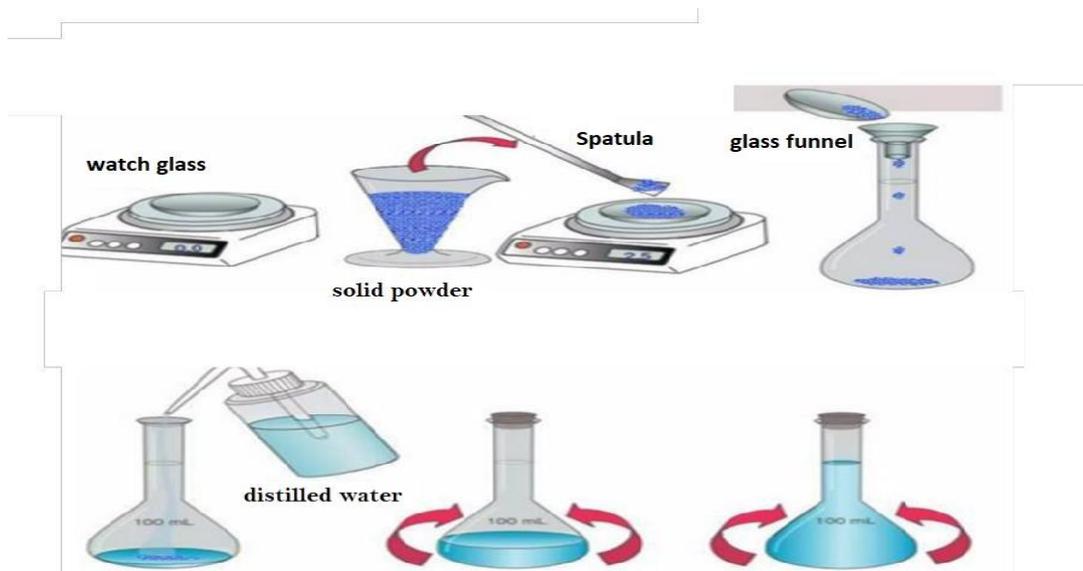
3 - Introduce the solid into a volumetric flask of volume $V= 250\text{mL}$ then rinse the used container with a distilled water bottle. The rinsing water must flow into the volumetric flask.

4- Fill the volumetric flask approximately at $3/4$ with distilled water.

5- Shake to accelerate the dissolution and homogenize the solution.

7- Make up with distilled water to the mark.

8- Adjust to the fill line with a squeeze bottle of distilled water, then cap and shake to homogenize.



Dissolution protocol

5- Questions

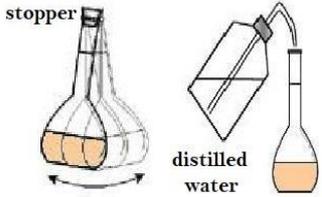
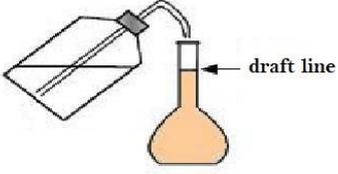
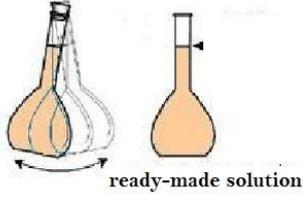
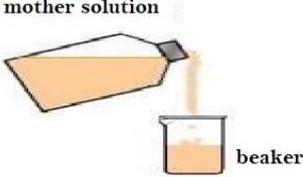
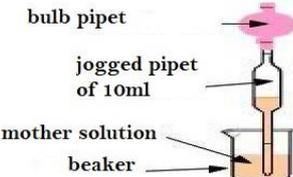
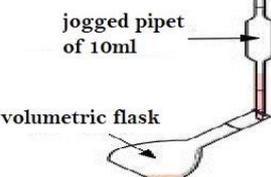
- Indicate the chemical species present in solution 1.
- b- Calculate the mass title $t(S)$ and the molar concentration $C_{(S1)}$ of the solution 1.
- c- Deduce the molar concentration of ions present in sodium chloride solution.

6- Preparation of solution by dilution

- We have a mother solution of NaCl of concentration C_M . We wish to prepare by dilution a volume $V_{F1}=100\text{ mL}$ of a mother solution of concentration $C_{F1} = C_M/10$ called solution 2.
- What mother solution volume V_M de should be taken?
- We do the same thing again, a dilution to a volume $V_{F2} = 100\text{ mL}$ of a solution with concentration $C_{F2} = C_{F1}/2$.
- What solution S_2 volume V_{F1} should be taken?

-During a dilution, the amount of solute material is retained between the mother solution and the daughter solution: $n(\text{mother}) = n(\text{daughter})$

7-Procedure: Dilution protocol

<p>First step : Pour Sufficiently of solution Mother in a beaker</p>	<p>Second step : Fill with a squeeze bottle of distilled water up to the fill line.</p>	<p>Third step : Pour the required volume of solution into the volumetric flask of appropriate volume (100 mL).</p>
		
<p>Fourth step : Add distilled water and stir to homogenize the solution.</p>	<p>Fifth step: Top up with a spray bottle of distilled water to the mark.</p>	<p>sixth step: Shake to homogenise. The solution is ready.</p>
		

7- Questions

- Determine the concentrations of S_2 and S_3 solutions
- Determine the dilution factor for both solutions S_2 and S_3 .