TP 1 : Preparation of a solution by dissolution or dilution.

I. Purpose :

- Develop a dissolution protocol.
- Implement a dilution protocol.

II.Materials :

-Analytical balance,

-Beakers, bowls or watch glass,

-100 mL volumetric flask,

-5 mL graduated pipette,

-Funnel,

-Squeeze bottle of distilled water.

-Sugar.

-Methylated spirits.

III. Some reminders :

In chemistry, a **solution** is a homogeneous mixture resulting from the dissolution of one or more **solute(s)** (dissolved chemical species) in a **solvent.**

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

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

In the laboratory, we can find ourselves faced with 3 types of situations,

namely having to prepare a solution:

- by dissolving a solid,
- by diluting a more concentrated liquid knowing its concentration.

III.1. Preparation of a solution from a solid (by dissolution):

A solution can be made by dissolving a solid species in liquid water. This is called **dissolution.**

Example :

We want to prepare V=100mL of a sodium chloride NaCl solution at **C=0.10 mol/L.**

The molar mass of sodium chloride is MNaCl=58 g/mol.

Let's calculate the mass of sodium chloride to be weighed: the 100mL of solution must contain

nNaCl=CV mol of NaCl, so the mass mNaCl to weigh is mNaCl= nNaCl.MNaCl= CVMNaCl

AN: mNaCl=0.58g.

III.2. Preparation of a solution by dilution:

We have a mother solution, of known concentration, from

which we prepare a daughter solution, less concentrated.

"Diluting an aqueous solution consists of adding distilled

water to it to obtain a less concentrated solution".

Diluting a solution 10 times is equivalent to dividing its concentration by 10,

diluting it 100 times is equivalent to to divide its concentration by 100.

We also speak of dilution to the tenth, to the hundredth. 10 and 100 represent the dilution factor.

III.2.1. Volume of stock solution to be taken:

- Mother solution Sm : mass concentration Cm
- Daughter solution to prepare Sf : mass , volume Vf. concentration Cf

First, we must calculate the volume Vm of mother solution to be taken, to which we add water up to volume Vf.

When a solution is diluted the mass of solute present does not change

- The mass of the solute in the sample of a volume Vm of the mother solution is

  Cm x Vm.

- The mass of the solute in the daughter solution will be equal to Cf x Vf.

- To dilute, only water is added to the mother solution, so the mass of solute

  is the same in the parent solution and the daughter solution. We therefore have the relationship:

Cm x Vm = Cf x Vf

Cm x Vm *ÿ mass of solute in the sample of stock solution*

Cf x Vf *ÿ mass of solute in the daughter solution*

- The volume Vm of the mother solution to be taken is therefore such that:

Vm = Cf x Vf / Cm

Cm and Cf are expressed in the same unit, for example in grams per liter (gL-1)
Factor

dilution: **F = Cm/ Cf = Vf/ Vm.**

III.3. Sizes and units:

- ***Molarity (or molar concentration),* Cx :** this is the quantity of solute matter per volume of solution. Classic unit: mol/L.

$$Cx = nx / VT$$

with nX the amount of solute matter, VT volume of solution.

- ***Mass concentration,* C'X :** this is the mass of solute per volume of solution. Unit classic: g/L.

$$C'X = CX \times MX$$

with MX the molar mass of the solute (in g/mol).

ACTIVITY 1: PREPARATION OF A SOLUTION BY DISSOLUTION

Mohamed applies for a job in a pharmaceutical industry, he hopes to land the production technician position. In order to prepare for a series of recruitment tests, he wants to review the solution preparation and asks the following question: how to prepare 100 mL of 5% glucose solution for infusion? First, he reads the instructions on an infusion bag and reproduced below :

Solution for infusion - Composition/Indication:

5% glucose solution.

780 kJ/L (186 kcal/L)

Dehydration

rehydration

hypertonic, energy supply,

1. What is the meaning of the indication "5% glucose solution" on the infusion?

Mohamed now wants to make 100 mL of glucose solution of concentration mass 5%.

You will help him: you have powdered sugar and a 100 ml measuring flask.

2. Photos of the steps to follow to carry out such a dissolution are shown below, they are placed in order.

Find an appropriate comment for each one.

Etape n°1	Etape n°2	Etape n°3
		

Etape n°4	Etape n°5	Etape n°6
		

3. Now carry out this solution.
4. Determine the mass concentration of the prepared solution in g/L.
5. If Mohamed had wanted to prepare 500 mL of this glucose solution, what mass of should glucose have weighed?

ACTIVITY 2: PREPARATION OF A SOLUTION BY DILUTION:

1.By diluting a liquid:

-Measure the mass m1 of an empty 100 ml graduated flask.

-Take V0 = 10.0 ml of commercial methylated spirits with a graduated pipette fitted with its pipette.
-Introduce them into the 100 ml graduated flask.
-Add distilled water to ¾, mix, then adjust to the gauge line with a squeeze bottle of distilled water.

-Cap and shake gently to homogenize. You obtain solution 2.
- Measure the mass m2 of the full flask

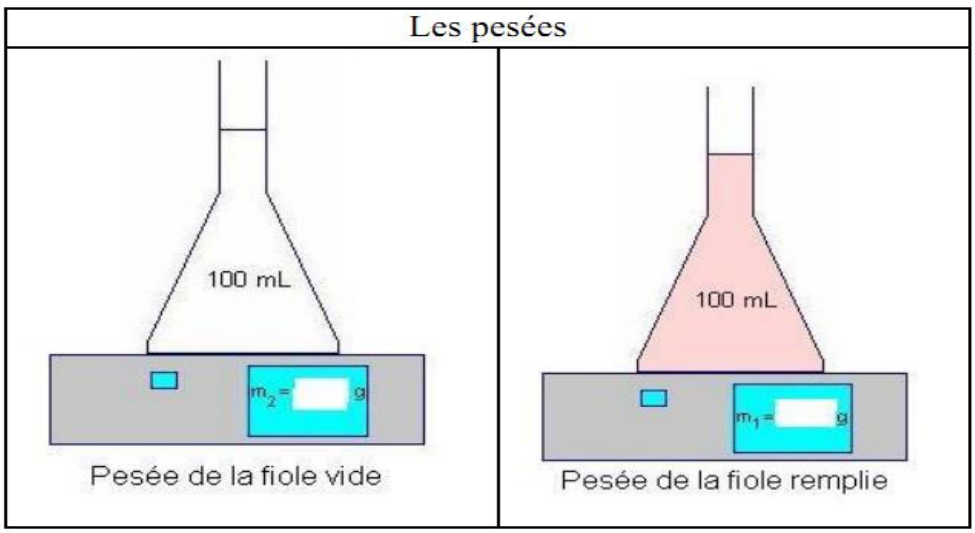
2)- Report:

Commercial rubbing alcohol contains primarily ethanol.

-The indication 90° means that the commercial methylated spirit contains 90% by volume of ethanol.

-It is not a pure substance, it is a mixture of ethanol and water.

The weigh-ins



a)- Determine the mass titer of solution 2 knowing that the density of ethanol is $\mu = 0.79$ g / ml.

b)- What species are present in the commercial solution and in solution 2?

c)- Determine the value of the density of solution 2.