TP N°V: Dosage of acid with a base: Application au dosage of commercial vinaigrette.

I. Objectives of Part I of the TP:

a) Use of precision glassware for dilution, then carrying out the dosage of a vinegar,

b) Check, using an acid-base dosage, the degree of acidity of a marketed vinegar

Definition of the acidity degree of vinegar:

The degree of acidity of a vinegar corresponds to the mass of acetic acid dissolved in 100 mg of vinegar, it is also the volume of acetic acid contained in 100 mL of vinegar (if we consider that $\rho_{vinegar} \approx \rho_{water}$=1g/mL).

II. Principle of a dosage (Titration)

II.1.Definition: The aim of a dosage (or titration) is to determine the concentration of a chemical species contained in a solution.

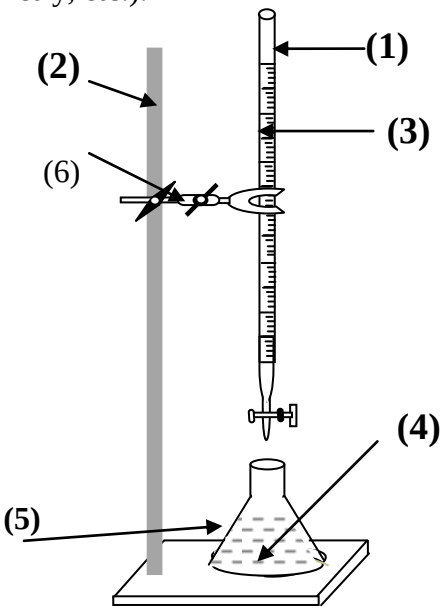
Examples: measurement of sugar in the blood, calcium in milk, etc. There are different techniques which depend on the properties of the species to be measured (color: colorimetry, acidity: acidimetry, density: densimetry, refractive index: refractometry, etc.).

II.2. Dosage (or titration) of an acid:

a)Experimental device:

(1) burette, (2) support (stand), (3) NaOH solution

(4) diluted vinegar, (5) Erlenmeyer flask, (6) Nuts



b) Principle: Dosage steps

- We take a sample of a precise volume V_1 of the acid solution dose: this is the test portion (to be put in the Erlenmeyer flask)
- A few drops of a corresponding colored indicator are added,
- Then, we gradually add the basic solution (contained in the burette) of known concentration

- When the reaction mixture in the Erlenmeyer flask changes color, we note the volume V_2 of the titrant solution poured. This volume then allows us to find the concentration of the acid (test sample).

c) Dosage accuracy:

The volume V_2 of titrant solution must be precisely determined. To do this, you must proceed in two stages:

1st step (rapid): to approximately locate the volume V_2, pour the titrant solution milliliter by milliliter until the colored indicator changes; we read the volume V_2 to the nearest 1 mL (example: V_2 is between 4 and 5 mL).

2nd step (precise): to precisely determine the volume V_2, we start the experiment again by pouring in one go a volume of the titrant solution slightly lower than V_2 (example: 3 mL), then we pour it drop by drop until when the indicator turns; we obtain the volume V_2 to the nearest drop. Do the dosage twice (02 readings: $V_2(1)$, $V_2(2)$).

II.3. Experimental part:

Dilution of vinegar Commercial vinegar is an aqueous solution containing acetic acid (CH_3COOH) with an initial concentration (C_o) that is too high. To dose it, you would have to dilute the solution.

*Prepare a 10 mL pipette, a 100 mL volumetric flask with its cap and a wash bottle filled with distilled water

dilution:

• Take 10 mL of vinegar (acidity level = 5°) using a pipette or a graduated cylinder,

• Introduce this test portion into the volumetric flask of volume 100 mL,

• Make up to the mark with distilled water to obtain a total volume of solution equal to 100 mL.

• Close the volumetric flask with a stopper and shake the solution to homogenize it. The solution thus prepared in the volumetric flask is called diluted vinegar.

• Put this solution (10 mL) in an Erlenmeyer flask and do the dosage with the NaOH solution (0.1N).

Repeat the experience a second time