Hilla University College
Medical physic department
Analytical Chemistry
First stage / First course

Lab. No. 3



Lecture

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Experiment No. (2) Prepare a standard solution

Preparation of a secondary standard solution from a liquid substance (preparation of a solution of hydrochloric acid with different concentrations).

the theory:

A solution: is a mixture of two or more substances that do not interact with each other and it is not possible to distinguish between the components of the solution (solute and solute) with the naked eye or microscope.

It is wrong to imagine that solutions result from dissolving a solid substance with liquid substances only, but it is possible to obtain solutions resulting from the dissolution of the solute in the three cases (gas - liquid - solid) in the solvent in its gaseous, liquid and solid states.

Solutions are called secondary standard when the dissolved substance is (liquid) because it is not possible to adjust the concentrations because of:

1- The volume is taken with the graduated cylinder and it is not a standard tool (the standard tools are the burette, pipette and volumetric flask).

2- When you open the flask of the liquid substance, the substance evaporates and this affects the concentrations.

Where the normality and molarity of a solution can be calculated if it is known:

Specific gravity or density

% Percentage

Molecular weight

Referring to the relevant tables in this regard, and from knowing this, it is possible to find the volume of the concentrated acid needed to be diluted to a certain volume to obtain the solution of approximate concentration.

Acid	Specific gravity	percent concentration by weight
Hydrochloric acid (HCl)	1.19	27.9
Sulfuric acid (H_2SO_4)	1.84	96.0
Nitric acid (HNO_3)	1.42	69.8

Materials and tools:

1- Concentrate Hydrochloric acid

2- Volumetric Flask

3- Beaker

4- Graduated Cylinder

5- Funnel.

6- Stirrer.

7- Distilled water

Procedure:

1- Using the dry graduated cylinder, measure (0.8 ml) of concentrated hydrochloric acid.

2- Put a quantity of distilled water in the volumetric flask (10 ml).

3- Fix the funnel over the volumetric flask, then pour the acid through it.

4- Complete the volume in the cylinder to the mark with distilled water and then close it with a cap.

6- Shake the solution in the flask vertically several times.

Calculation:

1- The molecular weight of the acid is calculated from the sum of the atomic weights of its components, which is equal to 36.5 g/mol.

2- The original normality of acid is calculated from the law:

$$\text{Normality} = \frac{\text{Percentage} \times \text{Specific gravity or density} \times 1000}{\text{Equavilant weight}}$$