

Preparation of Standard Solutions

Introduction:

For the preparation of standard solutions the purest reagents available should be used. The analytical reagent quality (AnalaR) is generally employed. If there is any doubt as to the purity of the reagents used, they should be tested by standard methods for the impurities that might cause errors in the determinations. In any analytical laboratory it is essential to maintain stocks of solutions of various reagents: some of these will be of accurately known concentration (i.e. standard solutions) and correct storage of such solutions is imperative. **Primary standards** are usually salts or acid salts of high purity that can be dried at some convenient temperature without decomposing and that can be weighed both at high degree of accuracy. **Secondary standards** are solutions that have been standardized against primary standards. For reagent solutions, it is sufficient to weigh out approximately the amount of material required, using a watch glass or a plastic weighing container, and then to add this to the required volume of solvent (distilled water) which has been measured with a measuring cylinder. To prepare a standard solution, a funnel is inserted into the neck of a graduated flask of the appropriate size. A suitable amount of the chemical is placed in a weighing bottle which is weighed, and then the required amount of substance is transferred from the weighing bottle to the funnel, taking care that no particles are lost. The funnel is thoroughly washed, inside and out, and then removed from the flask. The contents of the flask are dissolved, if necessary, by shaking the liquid, and then made up to the mark. For the final adjustment of volume, a very fine jet is employed. A normal solution is defined as one that contains one equivalent mass of a substance per liter of solution.

Objectives:

To prepare primary and secondary standards and to understand the principles involved in their preparation.

Materials:

Analytical balance, 250-ml Erlenmeyer, sodium carbonate, pH meter, methyl orange indicator, magnetic stirrer, standard buffers, sulfuric acid, volumetric flasks, and beakers.

Procedure:

1. Prepare one liter of standard 0.02N Na_2CO_3 by dissolving 1.06g anhydrous reagent grade Na_2CO_3 , dried at 103°C , in distilled water.
2. Dissolve..... ml concentrated sulfuric acid in distilled water and make up to 1000 ml.
3. Mount a 25 ml burette and fill it to the mark with the acid solution.
4. Take 50 ml of Na_2CO_3 solution in an Erlenmeyer flask, add 5 drops of methyl orange indicator and place on a magnetic stirrer.
5. Add acid slowly while stirring till orange colour turns to pink

6. Check the pH of the solution after titration is completed which should be approximately 4.3
7. Record the volume of acid used.
8. Repeat titration two more times and calculate average volume of acid used.

Calculations:

Calculate the normality of the sulfuric acid (H_2SO_4) using the relationship:

$$N_a * V_a = N_b * V_b$$

where: N = normality; V = volume; a = acid; b = base