Department of biology

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((Analytical Chemistry))

Stage (-1-)

LEC- (2)

Preparation of Solution Concentration and pH Adjustment

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Introduction

Accurate preparation of solutions and correct pH adjustment are fundamental in analytical chemistry. Most laboratory experiments depend on proper concentration and suitable pH values.

1. Solution Concentration

Definition

Concentration is the amount of solute dissolved in a specific volume of solution.

2. Number of Moles

Formula

$$n = \frac{m}{M.W}$$

n= number of moles

m= mass of the substance (g)

M.W = molecular weight (g/mol)

The number of moles is calculated by dividing the mass of a substance by its molecular weight.

3. Molar Concentration (Molarity, M)

Definition

Molarity is defined as the number of moles of solute per liter of solution.

Preparation Steps

1-Calculate the required number of moles.

2-Calculate the required mass of the solute.

3-Weigh the solute using an analytical balance.

4-Dissolve the solute in distilled water.

5-Transfer the solution to a volumetric flask and dilute to the mark.

4. Concentration in Parts Per Million (ppm)

Definition

ppm expresses the concentration as milligrams of solute per liter of solution.

$$\text{ppm} = \frac{mg}{L}$$

5. Preparation of Diluted Solutions

Dilution Equation

$C_1V_1=C_2V_2$

6. pH of Solutions

Definition

pH is a scale used to measure the acidity or basicity of a solution.

pH < 7 → Acidic

pH = 7 → Neutral

pH > 7 → Basic

7. pH Adjustment

Method

*To decrease pH, add a dilute acid.

*To increase pH, add a dilute base.

*The acid or base should be added dropwise with continuous stirring.

8. Measurement of pH

Methods

1-pH meter: Highly accurate and requires calibration before use.

2-pH paper: Fast and simple, but less accurate.

Common Errors

1-Incorrect calculations.

2-Using non-distilled water.

3-Failure to calibrate the pH meter.

4-Adding acid or base too quickly.

Conclusion

Correct preparation of solution concentration and pH ensures reliable and accurate laboratory results.