PREPARATION OF BIOLOGICAL SOLUTIONS AND SERIAL DILUTIONS

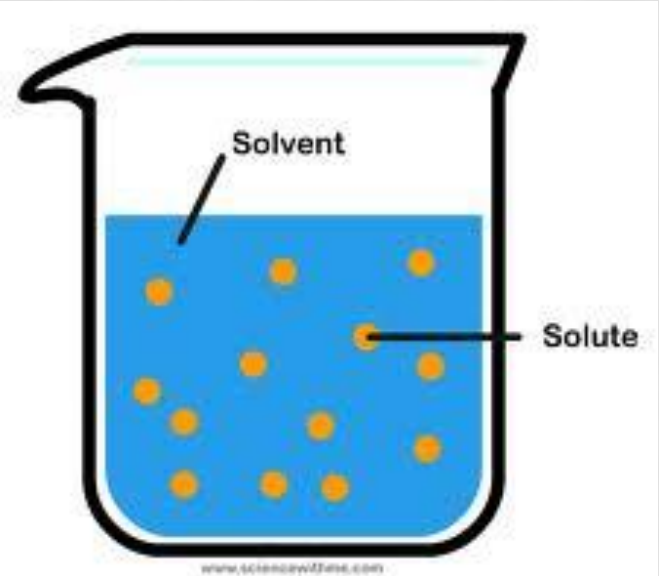
OBJECTIVES

- 1) To learn how to prepare solutions.
- 2) To get familiar with solution dilutions.

- It is very important to understand how to prepare solutions and make dilutions and it is an essential skill for biochemists which is necessary knowledge needed for doing any experiment.

SOLUTION, SOLUTE AND SOLVENT

- **Solution**: is composed of one or more substance (the solute) dissolved in another substance (the solvent) forming a homogenous mixture .



A. PREPARATION OF BIOLOGICAL SOLUTIONS

- **There are many units for concentration:**

1. Molarity
2. W/V %
3. W/W %

1-MOLARITY

- is the number of moles of solute dissolved in one liter of solution.
- Example:
- Prepare 100 ml 0f 2 M NaCL .
- First, we must calculate number of moles so we can calculate the weight in grams.
- Molarity=$\frac{number\ of\ moles}{volume\ in\ liter}$
- Number of moles=Molarity x volume
- =2 x 0.1 = 0.2 moles
- Now, we need to calculate grams of NaCl:
- Weight= mole x molecular weight

=0.2 x (23 + 35.5)=11.7 grams

We dissolve 11.7 grams of NaCl and make up the volume to 100 ml

MOLARITY

1. Place a beaker in a balance and zero the balance.
2. Weight 11.7 grams of NaCl , in the beaker and dissolve in little water (less than 100 ml)
3. Once the solid is dissolved the volume is transferred to 100 ml volumetric flask.
4. Brought up to a final volume 100 ml.

2-W/V %

- **The number of grams of solute dissolved in 100 mL of solution.**
- For example:
- 3% of NaOH
- Mean 3 grams of NaOH is dissolved in 100 ml of the solution
- **Preapare 50 ml of 4% NaOH**
- 4g------→100 ml
- ?-------→50 ml
- Weight = $\frac{4\ x\ 50}{100} = 2\ grams$
- 2 grams of NaOH is dissolved in little water and the volume made up to 50 ml

W/W%

- The number of grams of solute dissolved in 100 gram of solution
- The concentrations of many commercial acids are giving in terms of w/w%.
- In order to calculate the volume of the stock solution required for a given preparation the density (specific gravity) of stock solution should be provided.

W/W%

- **Prepare 100ml of 0.4 M HCl solutions starting with the concentrated HCl solution you are provided with. (w/w% = 36% , S.Gr = 1.15).**

- Weight= volume(ml) x SGr x w/w% as decimal
- **Important Note!!!**: the volume in this formula is not the required volume in the question, it is the volume of the concentrated HCl that you must add.
- First we must calculate the weight by the following:
- Mole=Molarity x volume in liter
- = 0.4 x 0.1=0.04 mole
- Weight= mole x MWt
- =0.04 x 36.5= 1.46 g
- 1.46=volume x 1.15 x 0.36
- Volume= 3.53 ml
- 3.53 ml of stock (i.e. concentrated HCl) solution is needed and the volume made up to 100 ml by the addition of water.

B-SOLUTION DILUTION

- **Example:**
- Prepare **30 ml** of a **1:50** dilution of the 0.07M solution
- 1ml---------→50 ml
- ?----------→30 ml
- (1 x 30)/50=0.6
- 0.6 ml of the starting solution (0.08M NaOH) is needed and volume made up to a final volume of 30 ml.

SOLUTION DILUTION

- **Example:**
- Prepare 50 ml of a 2.5x10-3M from prepared 0.4M HCl.
- C1 x V1 = C2 x V2
- 0.4 x V1 = 2.5x10-3 x 50
- V1=0.337 ml
- 0.337 ml of the starting solution is taken and final volume made up to 50 ml by the addition of water.