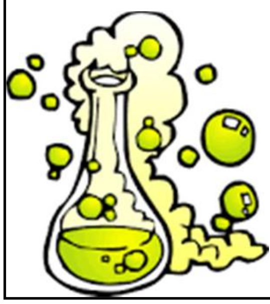
Preparation of Solutions



Lecture 2

Preparation of Solutions

It could be prepared either from:

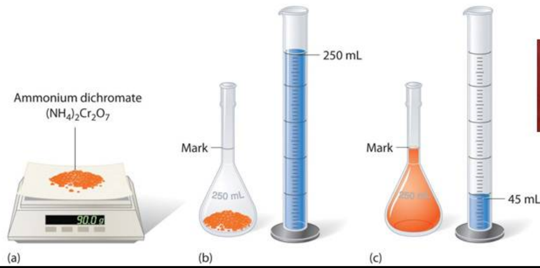
1- Solid material.

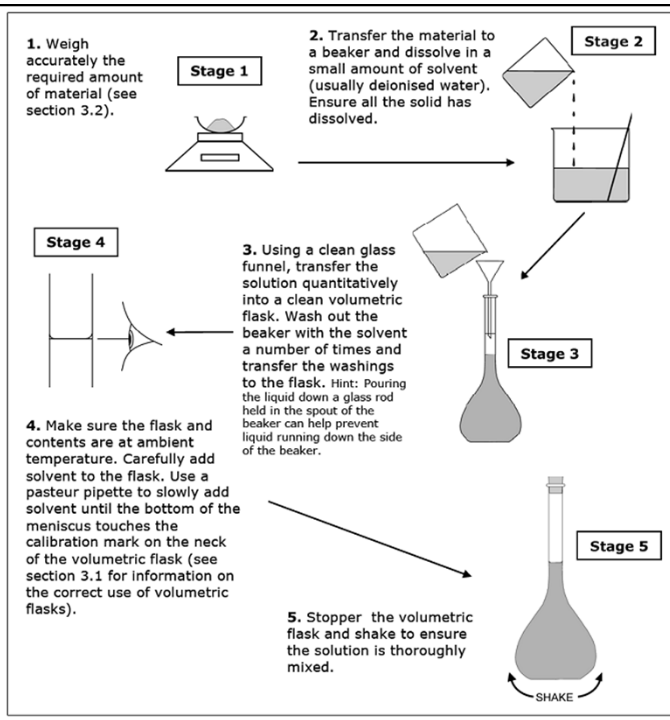
2-Liquid.

Preparation of Solutions from Solid Material

In general it follows a 4 steps:

1. Weigh the solute.
2. Dissolve the solute.
3. Make up the solution to a known volume.
4. Homogenise.

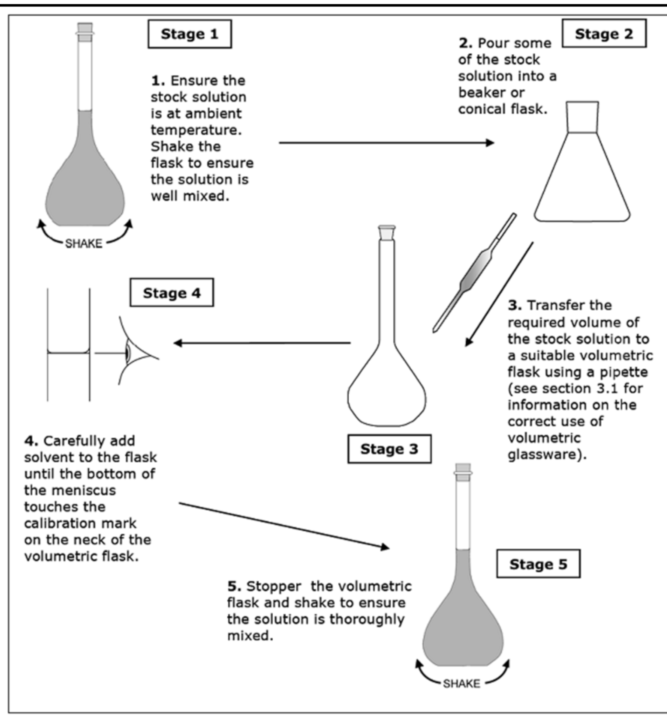




Preparation of Solutions from Liquid

- Solutions are often prepared by diluting a more concentrated stock solution.

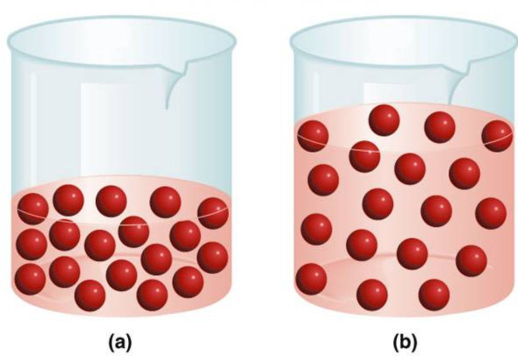
1. A known volume of the stock solution is transferred to a new container.
2. Make up the solution to a known volume.
3. Homogenise



Dilution

- It is the procedure for preparing a less concentrated solution from a more concentrated one.
- When a solution is diluted, solvent is added to lower its concentration.
- The amount of solute remains constant before and after the dilution: moles BEFORE = moles AFTER.
- To calculate the concentration: $\boldsymbol{C_1 V_1 = C_2 V_2}$
- $\boldsymbol{C_1}$ = concentration of stock
- $\boldsymbol{V_1}$ **=** Volume of stock
- $\boldsymbol{C_2}$ = concentration of diluted
- $\boldsymbol{V_2}$= Volume of diluted

Dilution Continue



Always remember that the number of moles DOES NOT CHANGE.

Dilution Continue

➢ Example

- A bottle of 0.5M standard sucrose stock solution is in the lab. How can you use the stock solution to prepare 250 mL of a 0.348M sucrose solution?

- *C1* V1= C2 * V2*
- *0.5 * V1= 0.348 * 0.25 L*

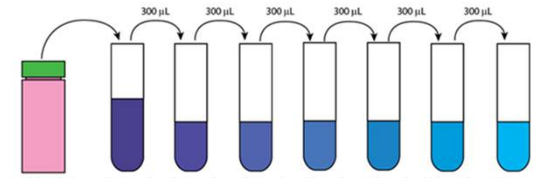
- *0.348 * 0.25 / 0.5 = 0.174 L*

- i.e: 174 ml of the stock solution will be diluted with water
- to reach the volume of 250 ml.

Serial Dilution

- The progressive dilution of a substance or infectious agent in a series of tubes or wells in a tray in predetermined ratios.
- Dilution starts first with stock solution and each diluted solution produced is used to prepare the next.
- A *serial dilution* is any dilution where the concentration decreases by the same quantity in each successive step.
- To calculate the concentration use the equation:

$$C_1 V_1 = C_2 V_2$$



Linear Dilution

- Same stock solution is used to produce samples of different concentrations.

To calculate the concentration: $C_1 V_1 = C_2 V_2$

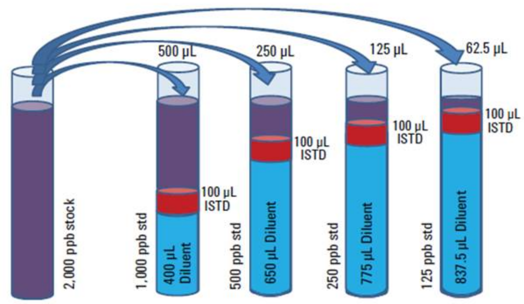


Figure 1. Linear dilutions.

Dilution Factor

- Dilution factor refers to the ratio of the volume of the initial (concentrated) solution to the volume of the final (dilute) solution.
- To make a dilute solution without calculating concentrations use a dilution factor.
- Divide the final volume by the initial volume.
- DF=Vf / Vi
- Vi = initial volume
- Vf = final volume (aliquot volume + diluent volume)
- DF of 100 = ratio 1:100

Dilution Factor Continue

- Example:

What is the dilution factor if you add 0.1 ml aliquot of a specimen to 9.9 ml of diluent?

- The final volume is equal to the aliquot volume PLUS the diluent volume:

  0.1 mL + 9.9 mL = 10 mL

- The dilution factor is equal to the final volume divided by the aliquot volume: 10 mL/0.1 mL = 1:100 dilution.

Dilution Factor Continue

- Example:

What is the dilution factor when 0.2 ml is added to 3.8 ml diluent?

Dilution factor = final volume/aliquot volume

Final volume = 0.2 +3.8 = 4.0 ml

Aliquot volume = 0.2 ml

4.0/0.2 = 1:20 dilution.

Dilution Factor Continue

➢ Example:

From the previous example if you had 4 tubes what would be the final dilution of tube 4?

- Since each dilution is 1:20 and we want to know the dilution of the FORTH tube so in this case it would be 1:20 multiplied FOUR times.

= 1:20 * 1:20 * 1:20 *1:20

= 1:160,000

Importance of Dilution

➢ Example:

A blood glucose of 800 mg/dl was obtained. According to the manufacturer the highest glucose result which can be obtained on this particular instrument is 500 mg/dl.

The sample must be diluted.

The serum was diluted 1:10 and retested.

The result is 80 mg/dL.

THIS IS NOT THE REPORTALBE RESULT!

You must multiply by the dilution factor of 10.

10 x 80 = 800 mg/dl.