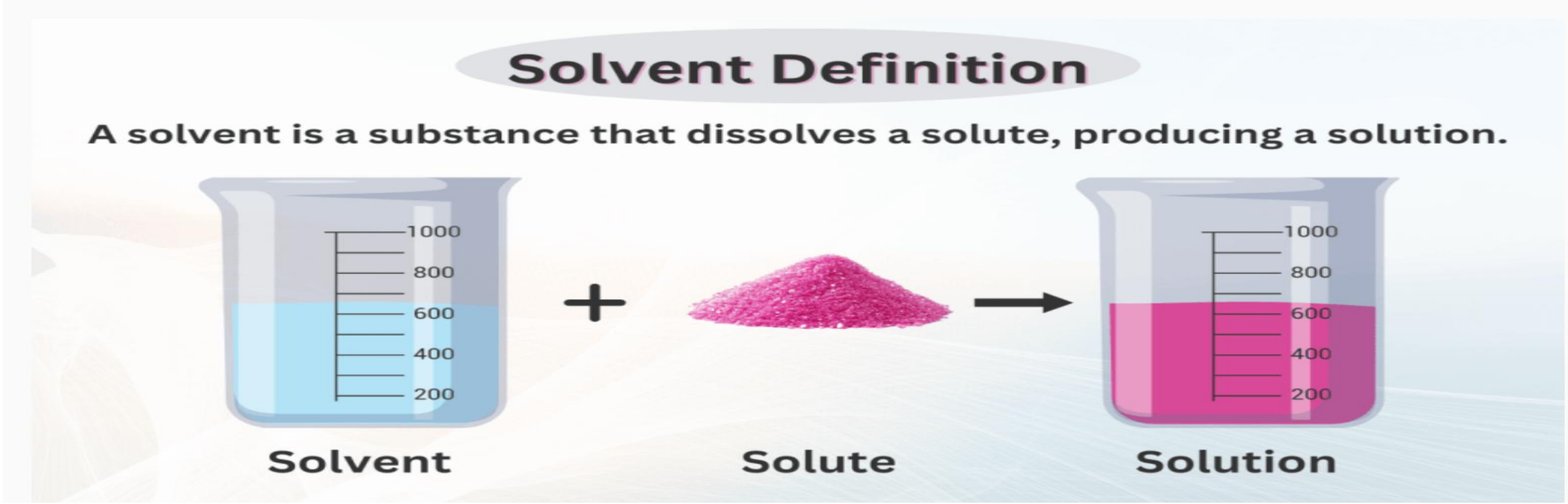
Course: MBIO 240

Laboratory Skills

What is PPM-Parts Per Million

Let’sLets understand some terms

Solution: A solution is a **homogeneous mixture of a solute and a solvent**, such as salt in water.
A **solvent** is a substance that **dissolves a solute**, resulting in a solution. It is typically present in the greatest amount in a solution and can be in various states, including **liquid, solid, or gas**.



What is a ppm solution?

- **Parts Per Million** is a measurement of the concentration of a solution.
- Parts per million is abbreviated as **ppm**
- Parts per million (ppm) is a unit used to measure very small concentrations of a substance in a mixture or solution.
- It is defined as one part of the solute per one million parts of the total solution, i.e one part of solute in one million parts of solution.

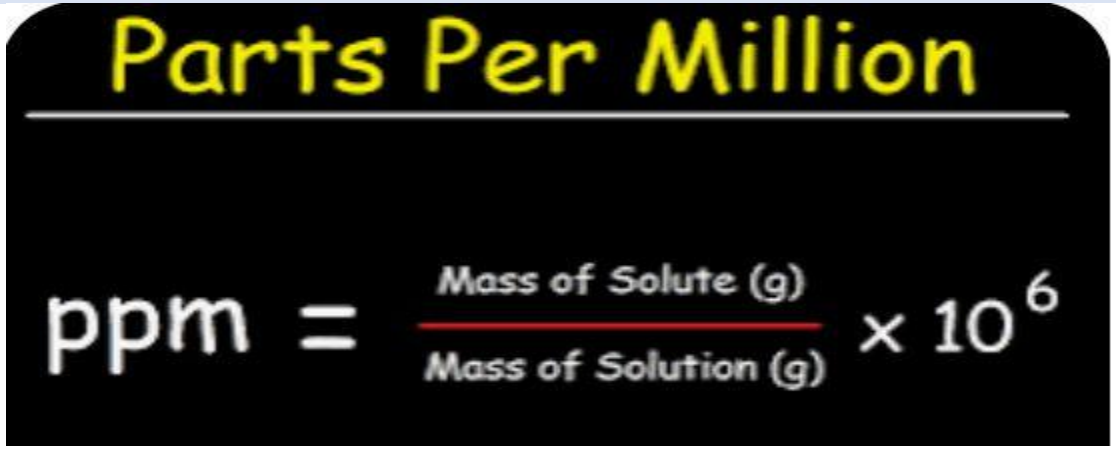
(In practical terms, ppm can also be expressed as the ratio of the number of parts of solids or solute to a million parts of the total volume).

- For example, a 10 ppm solution means that there are 10 grams of solute in every million grams of solution.

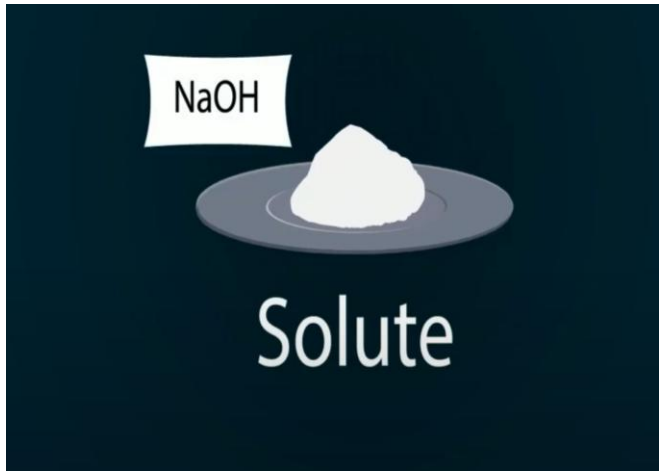
Formula

$$ppm = \frac{\text{Mass of Solute}}{\text{Mass of Solution}} \times 10^6$$

Make sure the units are the same.



Apparatus and Chemicals

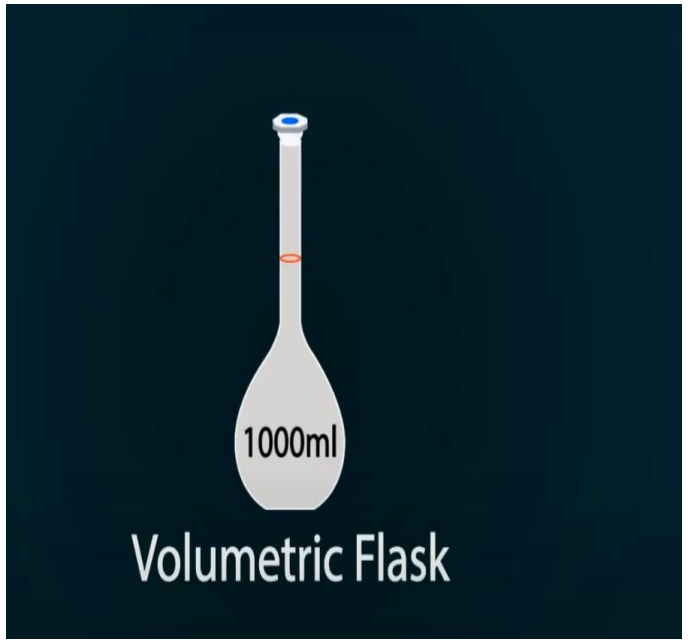

NaOH
Solute


Spatula


Distilled Water
as Solvent


0.000
gm
ON/OFF
MODE
TARE
Weight Balance

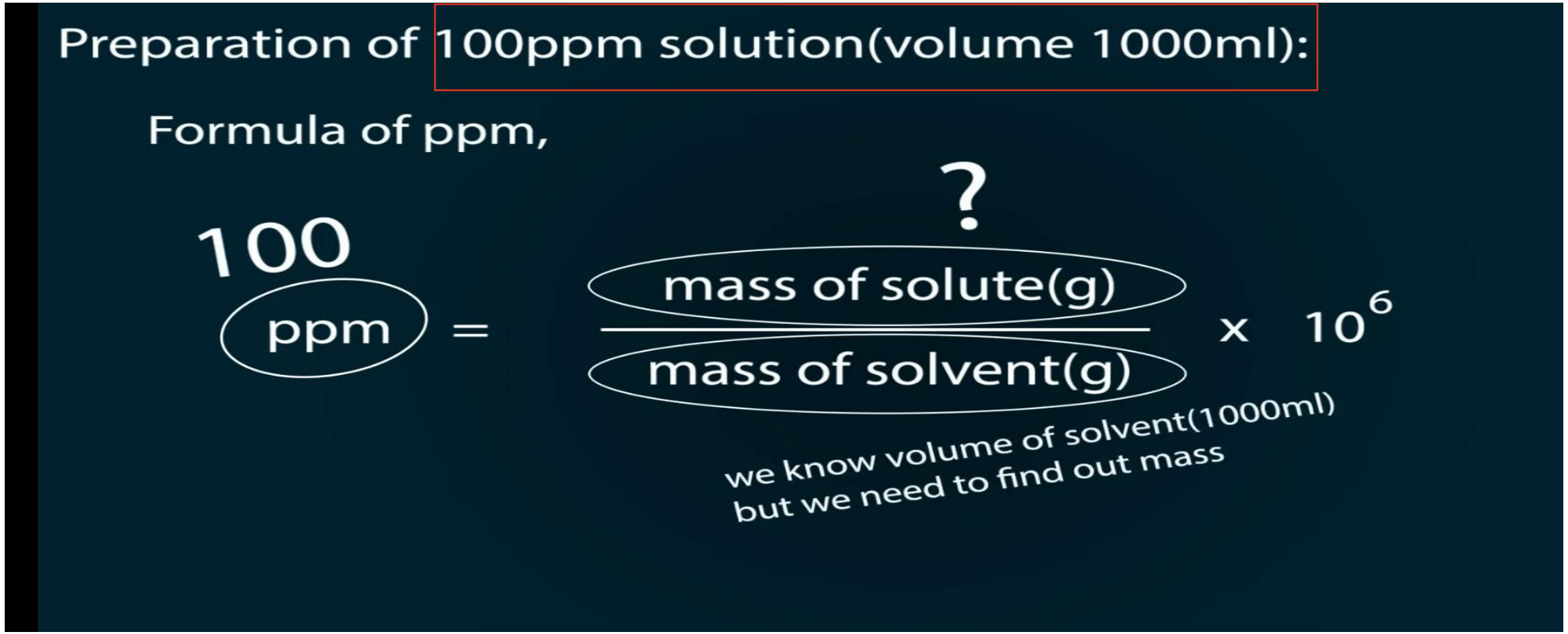

weighting paper


1000ml
Volumetric Flask


Funnel

Preparation of 100 ppm solution of NaCl

- 100ppm=Mass of solute (g)/1000 (g)x1000000)



Preparation of 100ppm solution(volume 1000ml):

Formula of ppm,

$$100 \quad \text{ppm} = \frac{\text{mass of solute(g)}}{\text{mass of solvent(g)}} \times 10^6$$

? 1000g

Rearrange the ppm formula,

1ppm = 1mg
so, 100ppm = 100mg

$$\text{mass of solute(g)} = \frac{100\text{ppm} \times 1000\text{g}}{10^6}$$

Preparation of 100ppm solution(volume 1000ml):

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$$\text{ppm} = \frac{\text{mass of solute(g)}}{\text{mass of solvent(g)}} \times 10^6$$

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Preparation of 100ppm solution(volume 1000ml):

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100

?

1000g

Rearrange the ppm formula,

1ppm = 1mg

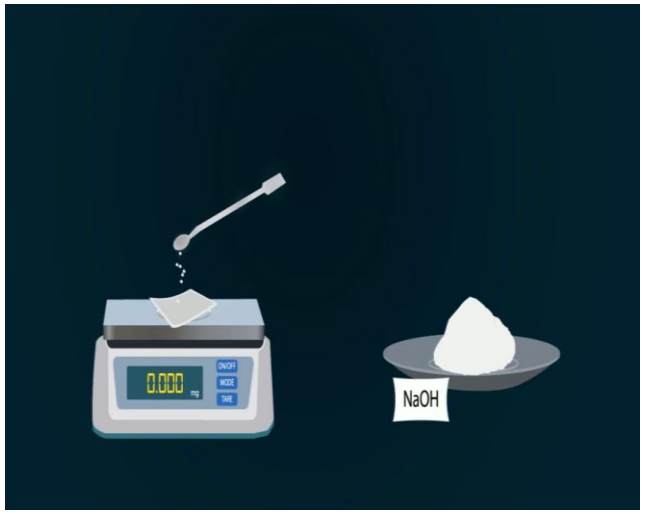
so, 100ppm = 100mg

1000g = 1000000mg

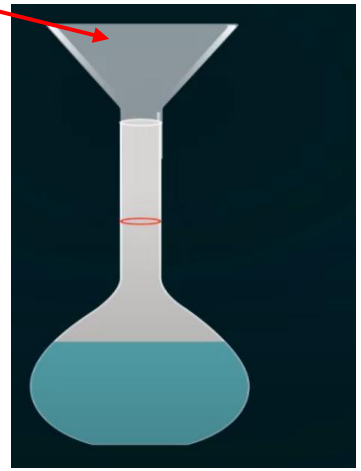
$$\text{mass of solute(g)} = \frac{100\ \text{mg} \times 1000000\text{mg}}{10^6} = 100\text{mg}$$

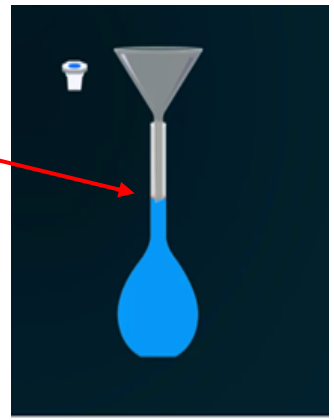
Weigh sodium hydroxide

Preparing a 100 ppm NAOH solution



Add the 100 grams of NAOH to a small amount of distilled water in a volumetric flask and then make up the volume with distilled water until the meniscus up to 1000 ml (100grams)





Preparation and dilution of PPM solutions

Brief Introduction

- **Stock solutions** are concentrated solutions used as a reference for preparing working solutions of known concentrations.
- In a biology lab, stock solutions are essential for various applications, including buffers, reaction mixtures, cell culture media, and liquid acids or bases.

Stock solution- and its dilutions

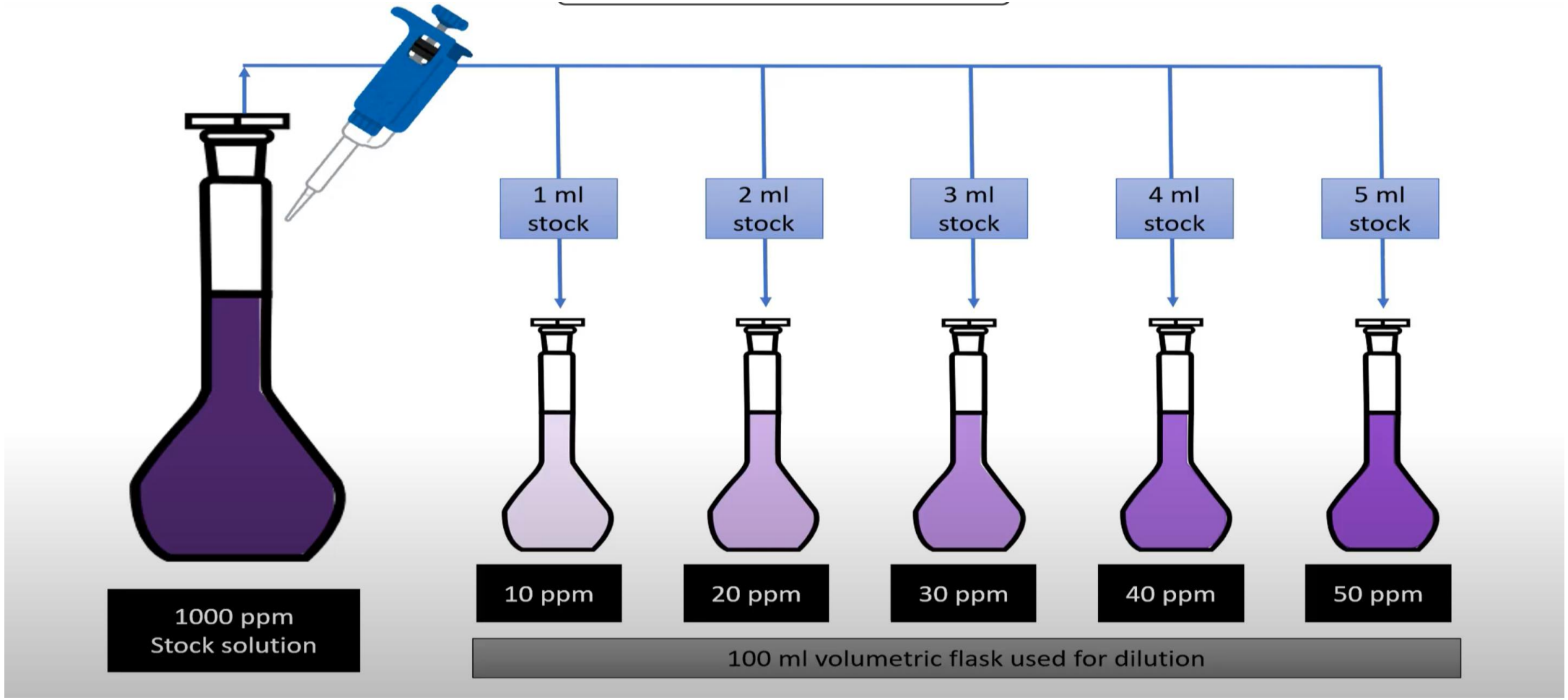
- For preparing a 100-ppm solution from a 1000 ppm solution, perform a **dilution **by taking 10 mL of your 1000 ppm solution and adding it to 90 mL of solvent, then mixing well. This reduces the concentration by a factor of 10.

- To prepare a 100-ppm solution from a 1000ppm solution, you would need to perform a dilution. Dilution involves reducing the **concentration **of a solution by adding more solvent without adding more solute. In this case, your **solvent **is the substance in which your solute (the substance in the 1000ppm solution) is dissolved.

- Take 10 mL of your 1000ppm solution. Add this to 90 mL of the solvent (this is typically water, but it could be a different liquid depending on what your solution is). Mix well.

- This will yield 100 mL of a 100-ppm solution, because you've added 1/10 of the original solution to 9/10 solvent, reducing the concentration by a factor of 10.

Preparation of dilutions from stock solutions



Eg: To create a 10 ppm standard, add 1 mL of the 1000 ppm standard to a 100 mL volumetric flask. Add DI water to mark (meniscus).

Home Work :

- Calculate ppm of 0.020 g of NaCl in a 4000 g solution.
- Prepare a detailed lab report on preparation of a 100ppm solution, write the aim, apparatus used, methodology, results and observations.