

# Making Solutions

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There are two basic “methods” of making a solution. The only difference between the two is the starting material. The first method is when you are starting with a solid solute. The second method is when you start with a “Stock” solution. MAKE SURE ALL VOLUMES ARE IN LITERS when doing calculations, but a lot of times the measurements are in mL. These directions are for making a fairly accurate solution. You could always replace the volumetric flask with any random container.

## Starting with a Solid

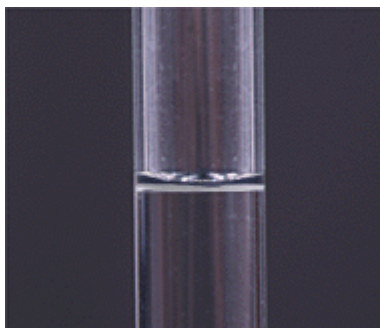
When starting with a solid, the material is usually not *hygroscopic* or you are going to determine the concentration of the solution later through some sort of standardization procedure.

- 1) Calculate the number of moles needed based upon the desired volume and molarity.  
$$\# \text{ moles} = (\text{Vol}_{\text{liters}})(M)$$
- 2) Convert the number of moles to grams using the molecular weight (MW).  
$$\# \text{ moles}(MW) = \text{mass needed}$$
- 3) Obtain that mass of solid.
- 4) Obtain the proper Volumetric Flask. Note the *TC* on the volumetric flask which stands for *Total Contain*



Example of a 500 mL Volumetric Flask

- 5) Fill the flask half way with the solvent.
- 6) Add the solid solute.
- 7) Mix until dissolved.
- 8) Add enough solvent to reach the final desired volume. (i.e. Fill to the single line on the neck of the flask.)



- 9) Cap and mix the solution by inverting the flask a few times.

### Starting with a “Stock” Solution

When starting with a “Stock” solution, the concentration of the “Stock” is fairly well known. You may have to standardize the new solution later after making it. If making a very weak solution, you may need to use the method of consecutive dilutions, where you dilute multiple times to achieve the desired concentration.

Essentially the same procedure described here is used, but multiple times.

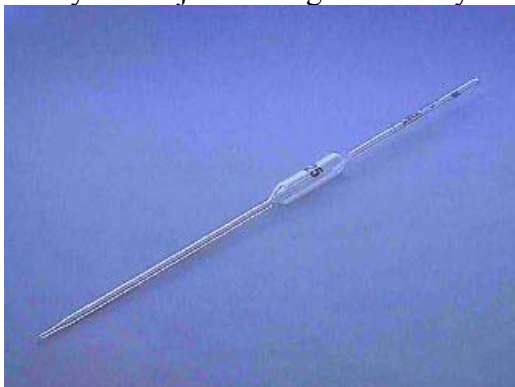
- 1) Calculate the number of moles needed based upon the desired volume and molarity.

$$\# \text{ moles} = (\text{Vol}_{\text{liters}})(M)$$

- 2) Calculate the amount of liters needed from the “Stock” solution to obtain those moles.

$$\text{Vol}_{\text{Stock}} = \# \text{ moles} / M_{\text{Stock}}$$

- 3) Obtain that volume of stock solution desired. If trying to be accurate, you are going to want to use a volumetric pipet or graduated pipet. Note the *TD* on the pipet, which stands for *To Deliver*. Other wise you can just use a graduated cylinder.



25 mL Volumetric Pipet



Graduated Pipet  
&  
Pipet Bulbs

- 4) Obtain the proper Volumetric Flask. Note the TC on the volumetric flask which stands for To Contain
- 5) Add the desired volume of stock solution to the Volumetric Flask.
- 6) Add about half of the solvent.
- 7) Mix
- 8) Add enough solvent to reach the final desired volume. (i.e. Fill to the single line on the neck of the flask.)
- 9) Cap and mix the solution by inverting the flask a few times.