Aqueous solutions

What is a Solution ?

A mixture that looks uniform

- Solutes (usually measured in g)
- Solvents (usually measured in mL)
- Mixed together until solute dissolves in solvent

Solutions are mixture

- Mixtures of 2 substances
  - Solutions – uniform mixtures
  - Special terms
    - See Discovery Education – Biotech compounds/labs
  - As you watch the video, list the terms that you hear related to solutions

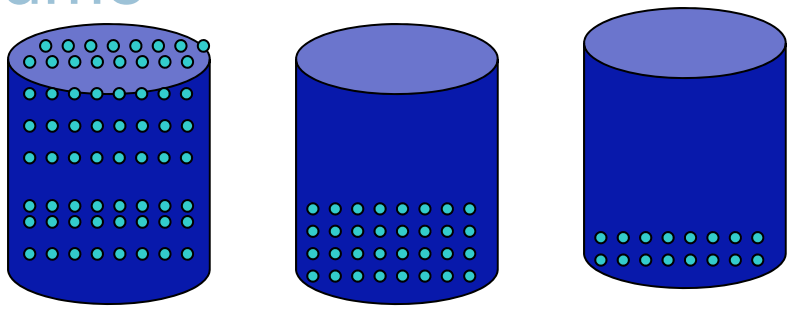
Solution Terms

- Solute
- Solvent
- Dilute
- Concentrated
- Aqueous solution

Remember 1mL = 1000 µL

$1mL = 10^{-3}L$
$1\mu L = 10^{-6}L$

$$\text{Concentration} = \frac{\text{solute}}{\text{solution volume}}$$

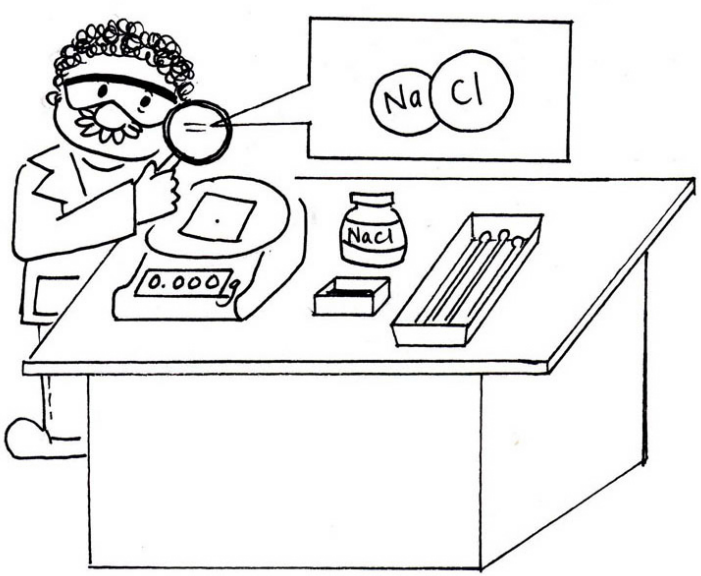


- Described by the portion of solute to solution volume usually in one of 3 ways:

- mass/volume
  - •5 g/L protease
  - •175 mg/mL rennin
  - •25 µg/µL chymosin

- % mass/volume
  - 2% glucose solution
  - 10% sodium hydroxide solution

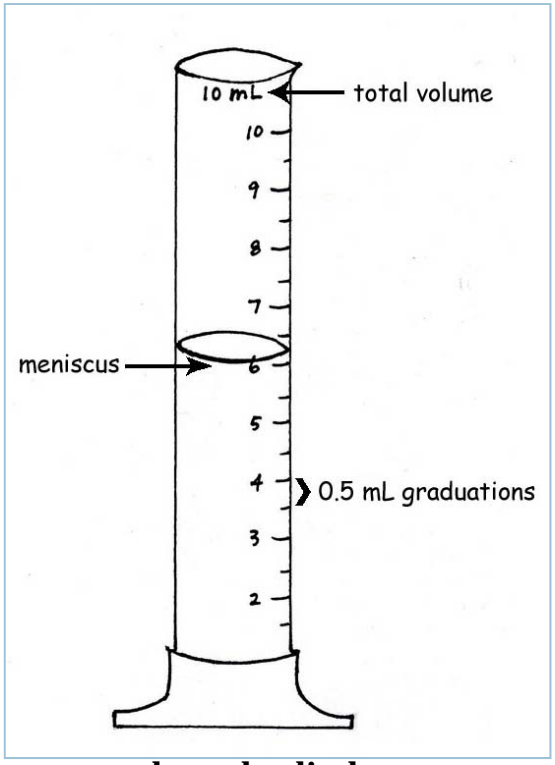
- molarity
  - 1*M* NaOH
  - 50 m*M* TRIS
  - 5 µ*M* $CaCl_2$



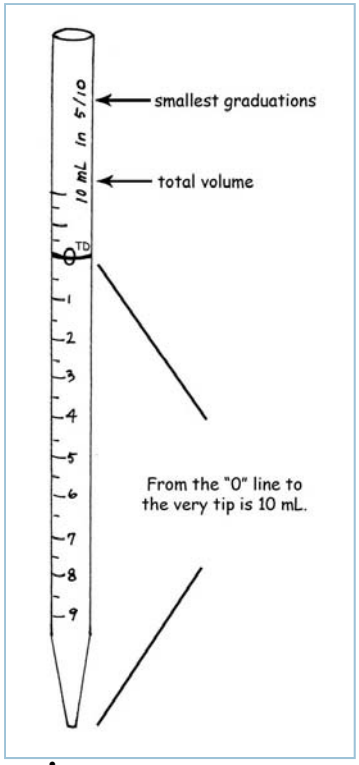
Solvent Measurement

Volume of solvent is usually measured using one of 3 instruments. For each, ask:

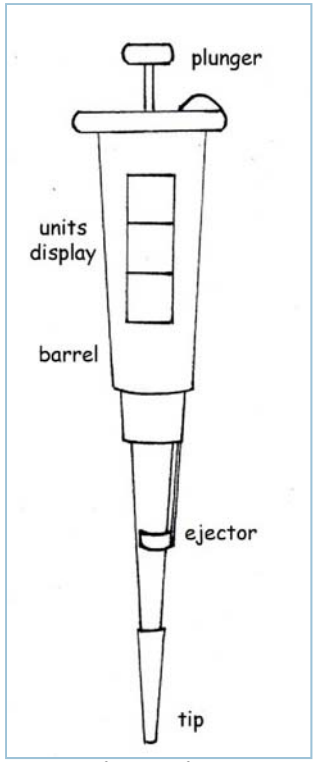
- What is the total volume that can be measured?
- What is the value of each type of graduation?



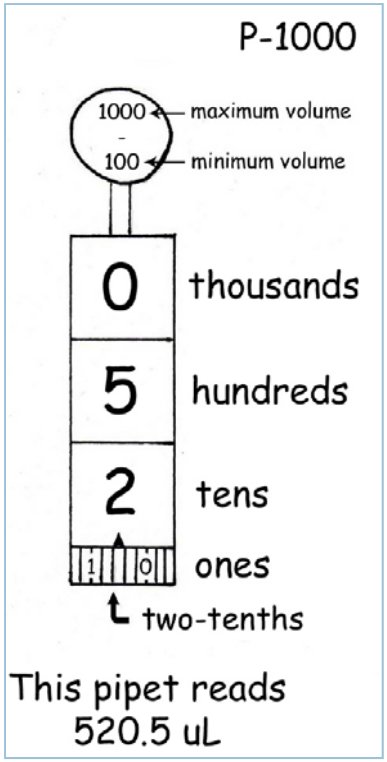
graduated cylinder



pipet



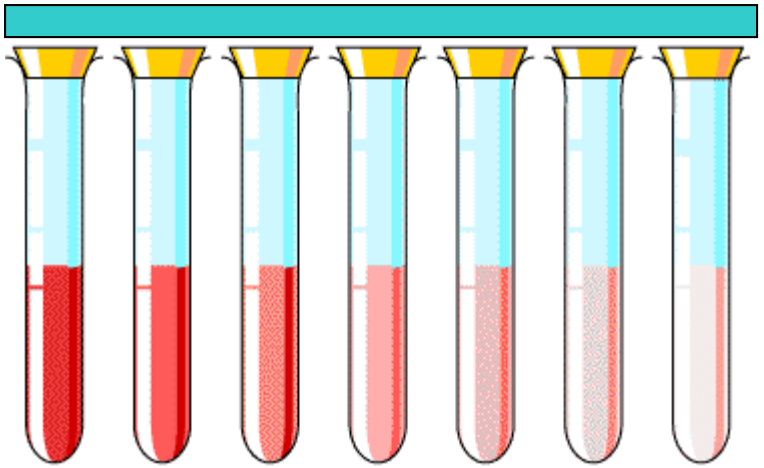
micropipet



Dilution using Stock Solutions

- Stock solutions –
  - Usually a concentrated solution

- Dilute to the needed amount



Dilution Factor

- Original Solution to Diluted Solution

  1: 10 = 1 to 10 dilution

- Combine 1 volume of original solution + 9 volumes of the solvent
- 1 + 9 = 10 dilution factor

Dilution Factor Example

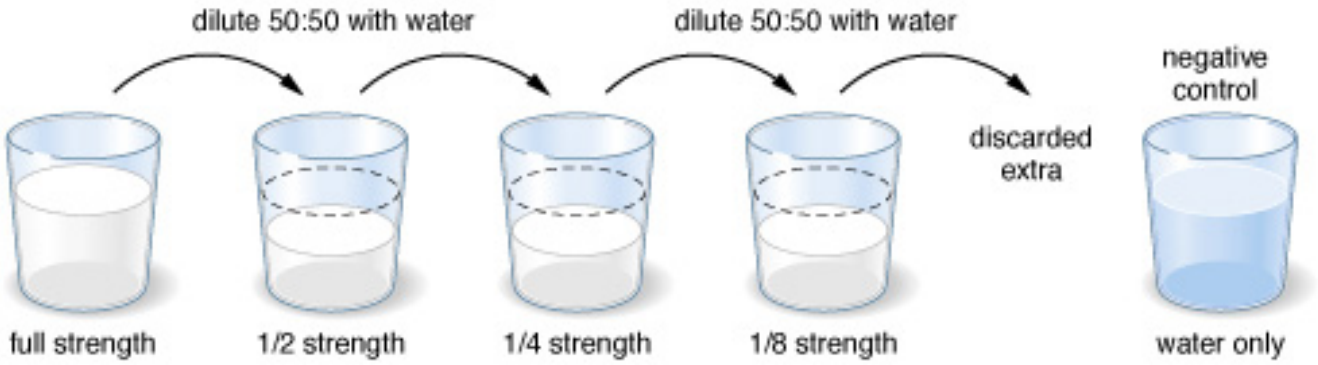
- Prepare 400 ml of a disinfectant that requires 1:8 dilution from a concentrated stock solution with water.

- Divide the volume needed by the dilution factor (400 ml / 8 = 50 ml) to determine the unit volume.
- The dilution is then done as 50 ml concentrated disinfectant + 350 ml water.

http://abacus.bates.edu/~ganderso/biology/resources/dilutions.html

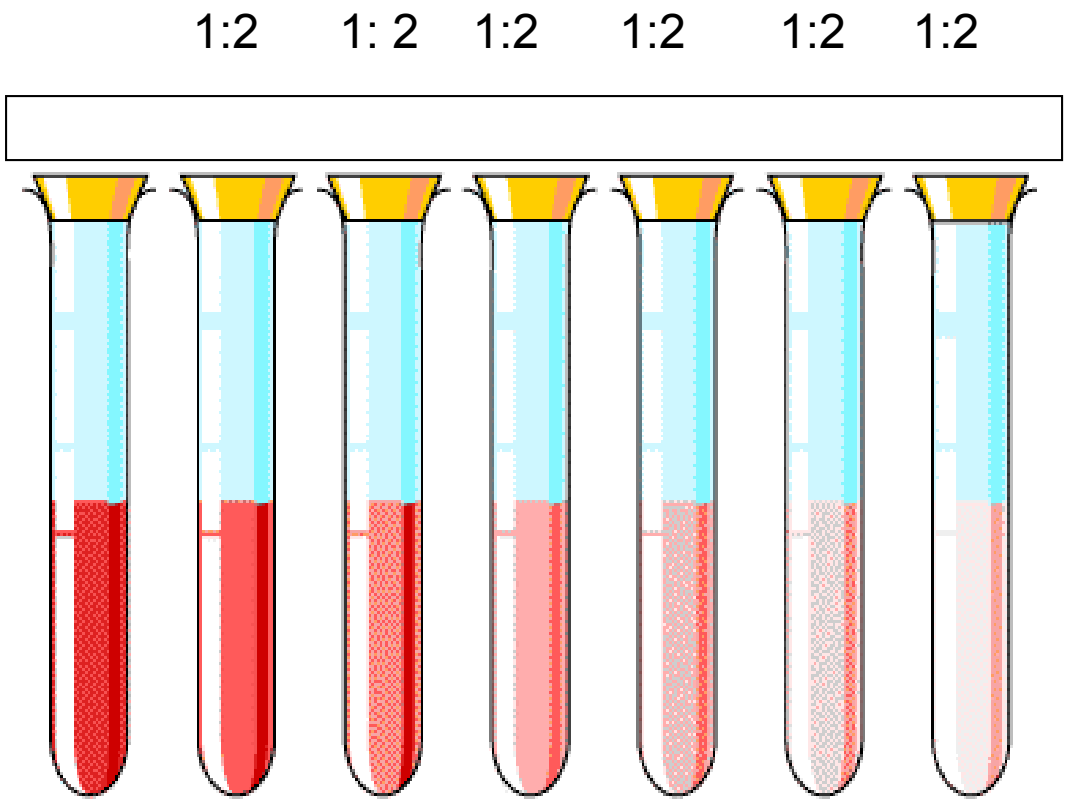
Serial Dilution

Hypothesis: If the original bleach solution is diluted repeatedly with water, the bleaching effect will lessen as concentration decreases.



Final dilution factor (DF) = DF1 * DF2 * DF3

Serial Dilution Example



Final Dilution

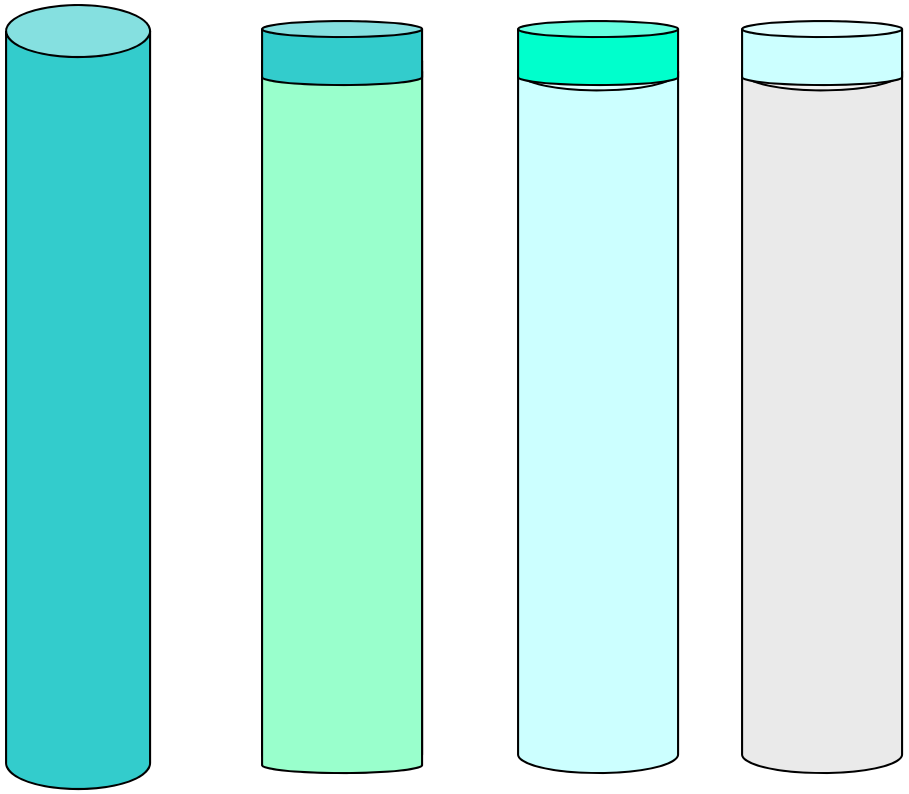
Final dilution factor: 2 x 2 x 2 x 2 x 2 x 2 = ?

Serial Dilution Example 2:

- 3 steps with each step at 1: 10 dilution

1 mL of the original solution

Add 9 mL of water to make 10 mL of the diluted solution



Final Dilution Factor = 10 x 10 x 10 = ?

Dilutions

Available Stock Solution and Needed Solution

$$C_1V_1 = C_2V_2$$

We need a certain volume and concentration for the lab work.

Therefore, we must calculate the volume of the stock solution to be poured out.

Calculate $V_1 = \frac{C_2V_2}{C_1}$