EMS Microscopy Academy

Endless Possibilities ...

Kirsch notes

Calculating
- Percent Solutions
- Molar Solutions
- Stock Dilutions

Percent Solutions

(expressed as: % = parts per hundred *OR* % = grams/100 ml)

Weight/Volume When working with solutions for biological applications, distilled or deionized water is usually the solvent of choice. There is the convenient relationship that 1 ml or 1 cc of water weighs 1 gram, so the formula to determine how much solute you need to make an aqueous solution is:

g = (Volume) x (Percent)

Example

You need 550 ml (Volume) of a 7% (Percent) solution of any solute.

Insert the numbers into the formula ... g = (550) x (0.07)

g = 38.5 g ... *You'll need 38.5 g of solute.*

Volume/Volume When 2 or more liquids are mixed together, use this formula:

ml = (Volume) x (%)

Example

You need 75 ml aqueous (aq.) of a 70% ethanol solution (when diluting using 100% ETOH)

Insert the numbers into the formula ... ml = (75) x (0.7) = 52.5 ml

Measure 52.5 ml of 100 % ethanol

Then bring the volume to 75 ml with dH_2O.

Molar Solutions

The formula: **grams of solute = (molarity) x (GFM) x (volume in liters)**

Example

You need to make 250 ml of 0.2 M Cacodylate buffer

Insert the numbers into the formula ... g = (0.2) x (214) x (0.250)

g = 10.7

Example

You need to make 750 ml of 0.15 M phosphate buffer with a 1:2.5 monobasic : dibasic ratio.

1. Determine the volume of each monobasic and dibasic needed.
2. Take the final volume (in this case 750 ml) and divide it by the total parts of the ratio:
   1 + 2.5 = 3.5
   750 / 3.5 = 214.3 ml
3. The volume for the monobasic part is:
   1 x 214.3 ml = 214.3 g = (0.15) x (138) x (0.2143) g = 4.43
4. The volume for the dibasic part is:
   2.5 x 214.3 ml = 535.75 g = 0.15) x (268) x (0.5357) g = 21.54

Summation: Add 4.43 grams of monobasic and 21. 54 grams of dibasic for a final volume of 750 ml

Stock Dilutions

The formula is $\mathbf{C_1 \times V_1 = C_2 \times V_2}$ ...

$\mathbf{C_1}$ is the concentration of the stock solution
$\mathbf{V_1}$ is the volume of the stock solution, usually the unknown part of the equation
$\mathbf{C_2}$ is the concentration of the working solution
$\mathbf{V_2}$ is the volume of the working solution

Example

You need to make a working solution of 250 ml of 2.5% glutaraldehyde using a 50% stock solution.

Insert the numbers into the formula ...

C_1 (50%) x V_1 (?) = C_2 (2.5%) x V_2 (250)

... solve for V_1 ...

V_1 = 625/50 = 12.5 ml of 50% into a volume of 250 ml

Example

Using the above example, you have a 10 ml ampule of 50% glutaraldehyde and you want to use it all.

Insert the numbers into the formula ...

C_1 (50%) x V_1 (10 ml) = C_2 (2.5%) x V_2 (? ml)

... solve for V_2 ...

V_2 = 500/2.5 = 200 ml is the final volume

Example

This example uses a Molar solution instead of a Percent solution: You need a working solution – 350 ml of 0.125 M buffer using a 2 M stock solution.

Insert the numbers into the formula ...

C_1 (2 M) x V_1 (?) = C_2 (0.125M) x V_2 (350)

... solve for V_1 ...

V_1 = 43.75/2 = 21.875 ml of 2 M stock into a volume of 350 ml

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