Calculating Liquid Chemical Dilutions

**Important Note:** All warnings, cautions and recommendations listed by the manufacturers/OSHA should be complied with when working with chemicals.

**Example No. 1 - Dry Powder-weight Dilutions**

Assume desired concentration of citric acid solution is 15 percent (%). Concentration of stock dry powder citric acid is 100 %. Total amount of 15 % solution desired is approximately 1000 milliters (ml) *

- 1 ml of purified water weighs 1 gram.
- 15 percent of the 1000 ml solution must be citric acid.
- 15% (0.15) x 1000 = 150 ml (or 150 g) of the solution must be citric acid and the remainder is 1000 - 150 = 850 ml of purified water (add 850 ml of water to 150 g of powder).
- to check your calculations:  150 ml (grams)  
  ------------ x 100 = 15 % solution  
  1000 ml total

**Example No. 2 - Stock Solution at 100 % Concentration**

Assume desired concentration of Flocide 375 peracetic acid solution is one percent (1 %). Concentration of stock solution is 100 % Flocide 375. Total amount of 1 % solution desired is 5 gallons.

- 5 gallons is equal to 640 fluid ounces (fl.oz).
- 1 % of the 640 fl.oz solution must be stock Flocide 375.
- 1 % (0.01) x 640 = 6.4 fl.oz of the solution must be Flocide 375 and the remainder is 640 - 6.4 = 633.6 fl.oz of purified water (add 633.6 fl.oz of water to 6.4 fl.oz of 100 % Flocide 375).
- to check your calculations:  6.4 fl.oz  
  ------------ x 100 = 1 % solution  
  640 fl.oz (5 gal)

- to convert fl. oz to ml or liters (l) refer to conversion chart on reverse side, 6.4 fl.oz = 189 ml, 633.6 fl.oz = 18.74 liters

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Example No. 3 - Stock Solution Not At 100 % Concentration

Assume desired concentration of hydrogen peroxide is 0.5 percent. Concentration of stock solution is 3 percent. Total amount of 0.5 percent solution desired is 1000 ml.

- 0.5 is what percent of 3? Or: \( \frac{0.5}{3} = 0.167 \) (16.7%)

- 16.7 percent of the 1000 ml solution must be 3% stock solution to make 1000 ml of 0.5 percent solution.

\[ 16.7 \% \times 1000 = 167\text{ml of 3\% solution} \]  
and the remainder is 1000 - 167 = 833ml of purified water.

- to check your calculations: \( 167\text{ml} \times 0.03 (3\%) \) \[ \frac{\text{x 100 = 0.5\% solution}}{\text{1000ml total}} \]

Example No. 4 - Converting PPM to Percent Concentration

Assume 500 part per million (ppm) sodium hypochlorite solution is to be mixed from bleach solution (5.25 % sodium hypochlorite). Desired amount of solution is 1000 ml.

- 1 million/1million = 100% therefore bleach which is 5.25% sodium hypochlorite is 5.25% (0.0525) x 1 million ppm's of sodium hypochlorite. A 500 ppm solution would be 500/1 million = 0.0005 or 0.05 percent sodium hypochlorite.

\[ 0.0525 \times 1 \text{ million} = 52,500 \text{ ppm of sodium hypochlorite in bleach.} \]

- 500 ppm is what percent of 52,500? Or: \( \frac{500}{52500} = 0.00952 \) (0.952 %)

- 0.952% of the 1000 ml solution must be stock bleach solution to make 1000 ml of a 500 ppm sodium hypochlorite solution.

\[ 0.952\% \times 1000 = 9.52 \text{ml of bleach} \]  
and the remainder 1000 - 9.52 = 990.48 of purified water.

- to check your calculations: 9.52 ml x 0.0525 (5.25%) \[ \frac{\text{x 100 = 0.05\% solution}}{\text{1000 ml total}} \]

Measurement Unit Conversion Chart

- 1 milliliter of purified water weighs 1 gram
- 1 pound (lb) = 453.6 grams
- 1 fluid ounce (fl.oz) = 29.57 milliliters (ml)
- 1 gallon (gal) = 128 fluid ounces = 3785 ml = 3.785 liters (l)
- 1 milliliter (ml) = 0.0338 fluid ounces (fl.oz)
- 1 liter (l) = 0.2642 gallons (gal)