

## Appendix 6

### Diluting HCl Concentration

The protocols in this book use two different concentrations of hydrochloric acid (HCl): 10% & 4%. Some suppliers sell both concentrations, while others only one. You may also find a source with a different concentration and wish to dilute it to 4 or 10%. The math to determine how much to dilute your stock solution is rather simple. You should have no problem if you know how to multiply, divide, add and subtract. Note: The same calculation works for citric acid if you have 50% and need to go down to 35%.

What you will need is:

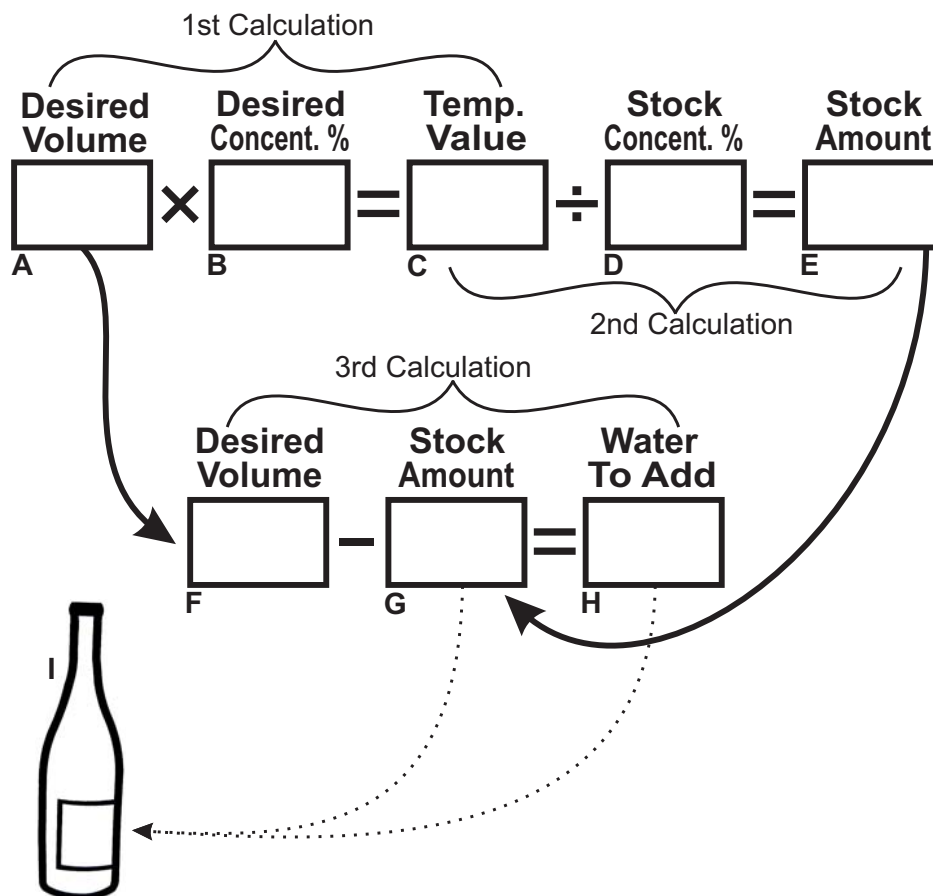
- Bottle of concentrated HCl (10% or higher)
- Receiving bottle to store the resulting diluted HCl
- Graduated cylinder or other measuring cup

On the next page is a graphical representation of the dilution equation. It may look intimidating at first glance, but it is actually quite simple and is made up of three simple mini-calculations. Each box is labelled with a letter which refers to the graphic. Just fill in the numbers with a pencil and follow the directions.

We'll go over one example here: Let's say you have 10% HCl and want to make 1 liter of 4% HCl. Here's what you would have to calculate:

Desired Volume 1000ml	×	Desired HCl % 4%	=	Temporary Number 4000
Temporary Number 4000	÷	Stock HCl % 10%	=	Amount of 10% HCl 400ml
Desired Volume 1000ml	—	Amount of 10% HCl 400ml	=	Amount of water 600ml

So, in this example, you would need 400ml of 10% HCl and 600ml of water. to make 1 liter of 4% HCl. If you add them together, you should have 1000ml (1 liter).



<b>A</b>	Determine the volume of the receiving bottle in milliliters. For example, if you have a 1 liter bottle, you would enter the number "1000" for 1000ml.
<b>B</b>	This is where you enter the % of the final solution. If you are making 4%, then enter "4" in this box.
<b>C</b>	Multiple <b>A</b> and <b>B</b> and enter the result into box <b>C</b> . This is a temporary value you will need for the next calculation.
<b>D</b>	This is where you enter the percentage of your concentrated stock solution—the HCl you want to dilute. If you have 10%, then enter a "10" in this box.
<b>E</b>	Now divide the temporary value in <b>C</b> by <b>D</b> and enter the result in <b>E</b> . This is the amount of concentrated stock HCl (in milliliters) you will need.
<b>F</b>	Copy what you entered in <b>A</b> to <b>F</b> for the next calculation.
<b>G</b>	Copy the result from <b>E</b> to <b>G</b> .
<b>H</b>	Do the subtraction of <b>F</b> – <b>G</b> and enter the value in <b>H</b> . This is the number of milliliters of distilled or filtered water you will need.
<b>I</b>	Measure the resulting volume of water calculated in <b>H</b> and pour it into the receiving bottle <b>I</b> . Finally, measure out the value in <b>G</b> and pour it into the receiving bottle <b>I</b> .