溶液中奎宁稀释系列的处理方案

Protocol for Dilution Series of Quinine in Solution

Background and Preparation of Stock Solution

For taking accurate measurements of chemicals, a stock solution is prepared with a known concentration. Here, we use mass concentration ρ defined as

$$\rho = \frac{m}{V}$$

其中m为奎宁的质量，V是溶剂的体积.　　在下面的例子中，制备具有质量浓度的原溶液

where m is the mass of quinine and V is the volume of the solvent. In the following example, a stock solution is prepared with a mass concentration of $\rho_{stock} = \frac{10\text{ mg}}{100\text{ mL}}$ in water.

To quantify the amount of quinine measured in a sample, we make a dilution series.
为了量化样品中测量的奎宁量，我们做了一个稀释系列

Dissolution Series

To obtain a diluted sample from the stock solution above, we first consider a diluted sample ρ_i and how we can add additional solvent V_i to a sample V_{stock} from the stock solution. This can be accomplished from the following relation

要从上述原液中获得稀释的样品，我们首先考虑稀释的样品，以及如何在样品中添加额外的溶剂从库存溶液

$$\rho_i(V_i + V_{stock}) = \rho_{stock}V_{stock}$$

The overall procedure is to extract a volume V_{stock} from the stock solution, followed by adding a volume V_i of the solvent to obtain a desired concentration ρ_i, we isolate V_i in the above equation to obtain 整个过程是从原液提取一个Vstock，然后加入体积Vi的溶剂以获得所需浓度,最后分离Vi

$$V_i = \frac{\rho_{stock}V_{stock}}{\rho_i} - V_{stock} = \left(\frac{\rho_{stock}}{\rho_i} - 1\right)V_{stock}$$

We can now list the wanted dilution series of wanted concentrations ρ_i, compute the volumes we need V_i when we extract a volume V_{stock} from the stock solution.
现在可以列出所需浓度的稀释，计算我们需要的体积Vi，当我们提取一个体积Vstock从库存溶液中提取

Table 1: Dilution series of quinine solvated in water at various concentrations

i	$\rho_i\left[\frac{\text{mg}}{100\text{ mL}}\right]$	V_{stock} [mL]	V_i [mL]	$V_{total} = V_{stock} + V_i$ [mL]
1	7.5	10	3.33	13.33
2	5.0	10	10	20.00
3	2.5	10	30	40.00
4	1.0	10	90	100.0

实验方案

Experimental Protocol

原液

Stock Solution

原液是通过测量m=10mg奎宁来配制的。将其转移到试管中，加入V=50mL水使奎宁完全溶解奎宁。此后，加入额外的水，直到试管的最终体积为100mL，得到所需质量浓度的原液.

The stock solution is prepared by measuring $m = 10\ \mathrm{mg}$ of quinine on a weight scale. Transfer this to a test tube and add $V = 50\ \mathrm{mL}$ of water to completely dissolve the quinine. Hereafter, additional water is added until the final volume of the test tube reads $100\ \mathrm{mL}$ yielding a stock solution with the required mass concentration ρ_{stock}.

Dilution Series

For each of the series outlined in Table 1 we perform the following:

1) Prepare test tube i for solution with mass concentration ρ_i.
2) Extract V_{stock} from the stock solution and transfer to test tube i.
3) Extract V_i from water beaker and transfer to test tube i.
4) Move test tube i to storage.

1)准备试管，以准备质量浓度为ρi的溶液

2)提取Vstock从原液中转移到试管中

3)从水杯中提取Vi，转移至试管中

4）将试管移至存储区