

COC Biotechnology Program



Data Gathering and Graphing Lab

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For more information on the College of the Canyons Biotechnology program contact Jim Wolf,
Associate Professor of Biology/Biotechnology at (661)259-7800 ext.3092 or email:
wolf_j@mail.coc.cc.ca.us

I. Objectives:

1. Become familiar with data gathering and graphing.
2. Understand individual ideas inherent in data collection and graphing with respect to volumetric devices and transfer. This idea of volumetric devices and transfer also relates to time management.
3. Address time management and learn to multitask and collaborate with your lab partners

II. Background:

Rules for the exercise:

1. You will be working in groups of two.
2. At the end of the lab, you will hand in the data set and a brief summary statement (to be completed by each lab partner separately, see question # 3.)
3. A lecture about some of the pitfalls to avoid, and general rules for graphing will be presented immediately prior to lab.
4. Using Excel, both a spreadsheet and graph will be prepared. Each partner should enter the data in the spreadsheet individually, and make their own histogram (to be handed in.)

Volumetric Determination Protocol Notes:

1. For most solutions (under normal pressure), as volume decreases, the mass decreases. This allows one to use mass measurements as a way to verify volumetric measurements (provided the density of the solutions is known.)
2. The standard error helps to avoid possible mistakes associated with a single erroneous sample. The larger the volume, the less the percent error will likely be. For example consider how a drop of solution would effect the measurement of 100 mls vs 0.1 ml. In the first measurement the drop is almost inconsequential, where as in the second, it effectively may double the volume measured (a 200 % error.) This is true up to a point for a given set of measuring devices. For example, the smallest volume measured with a transfer pipette is also the least accurate (i.e. 0.1 ml transferred in a 10 ml pipette). Once a new device is used, the accuracy is restored up to point (as with a micropipette that has a maximum volume of 0.1 ml (100 μ l).

III. SOP:

- Determine the weight of different volumes of water. The volumes are 10 µl, 50µl, 100µl, 500µl, 1 ml, 5ml, 10ml, and 50 ml Use the following devices: 2-20 µl micropipette, 20-200 µl micropipette and 10 ml serological pipette Try to ensure as accurate a transfer of fluid as possible. Remember to record what device was used for each transfer.

Volume	% Error			Average
	1	2	3	
10 µl				
50µL				
100µL				
500µL				
1mL				
5mL				
10 ml				
50mL				

- Repeat and record each measurement three times.
- Calculate the % error from the theoretical weight (recall that water has a density of 0.9976 g/ml @ room T°).

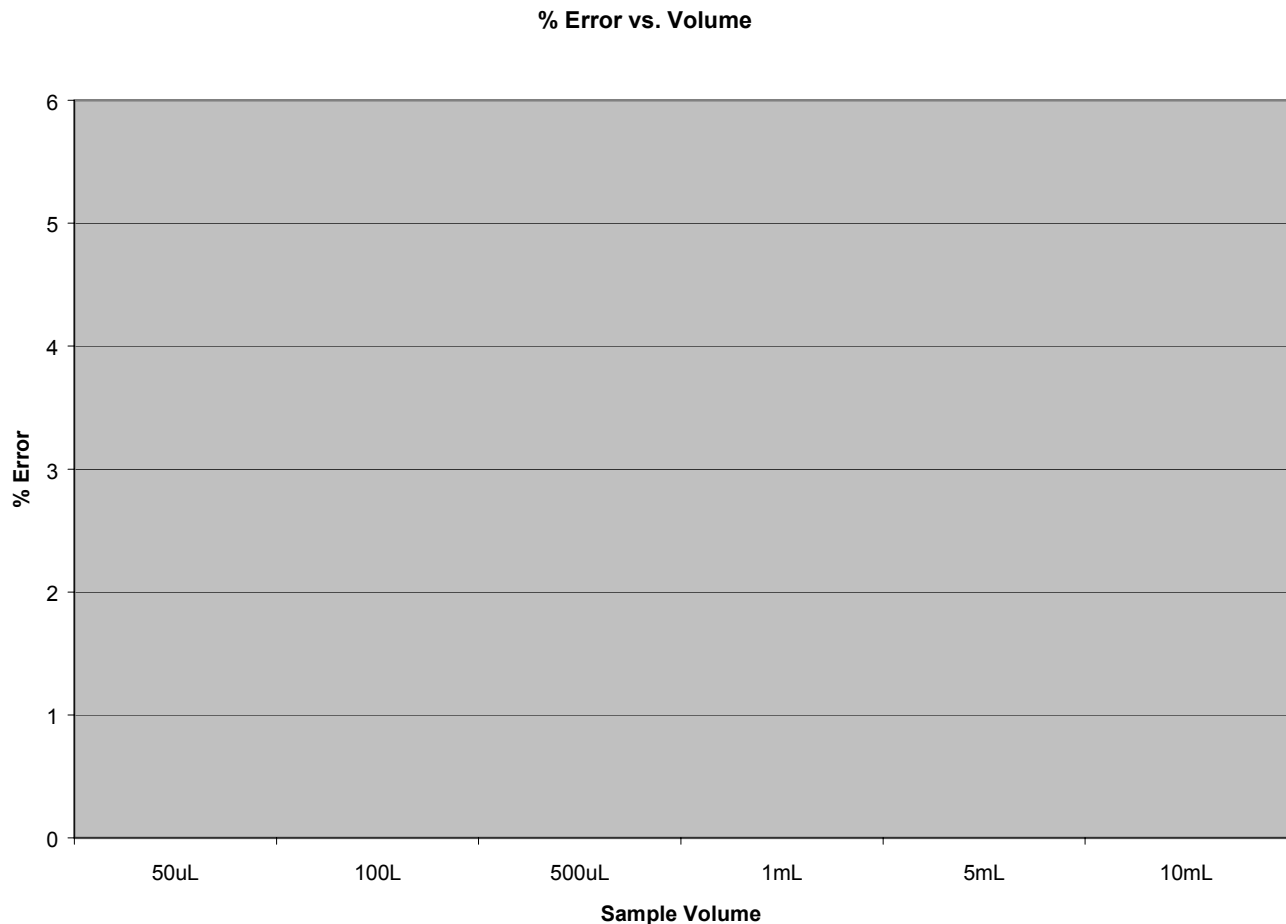
$$\%Error = \frac{ExpValue - TheoreticalValue}{TheoreticalValue} \times 100$$

Volume	% Error			Standard Error
	1	2	3	
10 µl				
50µL				
100µL				
500µL				
1mL				
5mL				
10 ml				
50mL				

- Calculate the standard error of each weight. For the purpose of this exercise, the standard error is simply the average of the three % error calculations.

$$\text{Standard Error} = \frac{(\% \text{ Error } 1 + \% \text{ Error } 2 + \% \text{ Error } 3)}{3}$$

5. Determine a correlation between mass and volume by graphing the data and standard error. Your graph should be a histogram like the one below (note; some of the values have been omitted for brevity.)



IV. Questions: (Answer all of the following in your summary statement)

1. What is the relationship between the mass and volume of water?
2. Why do you calculate standard error (as opposed to just % error?) Is there any relationship between it and the volume measured?
3. What can you deduce about need for critical measuring as a function of volume?
4. If micropipettes are often more accurate than serological pipettes, why not use a micropipette for all lab measurements. List three reasons as to why this may not be such a good idea.
5. Using computer lab resources, recreate above graph in Excel and hand in. Looking at the data, comment on the trends. Consider the major shifts in the data as related to the volumes measured and the devices used. Now write a 1-2 paragraph summary statement and include all of the aforementioned ideas. Each partner should write and submit their own summary statement. This is good practice for your lab notebook and will be edited and returned to you by the next lab.

The previous lab protocol can be reproduced for educational purposes only. It was been developed by Jim Wolf, and/or those individuals or agencies mentioned in the references.

