

Chemistry 14BL

Calculating % Inherent Error for Experiment #2 Post-lab Report

Please read lecture guide #1 or the lab manual (p. 23 - 27) on how to calculate % relative error for various mathematical operations BEFORE you follow the steps shown below. It will help you to understand the formulations on this handout.

Note: [] means that the quantity has a unit of mol/L. Δ () means the absolute error of the specified equipment. Refer to page 27 for absolute errors in various lab equipment.

(I) % Inherent error (or sometimes refer to as % relative error) for solution 1:

$$[\text{Solution 1}] = \left(\frac{\text{Wt. of the Food - dye}}{\text{Molecular Weight}} \right) \div (\text{Total Volume of the Solution in Liters})$$

Since the only mathematical operations involved in the above equation are multiplication and division, we can use the relative error equation that is specific design for multiplication and/or division as outlined on lecture guide #1 or in the lab manual.

$$\frac{\Delta [\text{Solution 1}]}{[\text{Solution 1}]} = \frac{\Delta (\text{Wt. of Food - dye})}{(\text{Wt. of Food - dye})} + \frac{\Delta (\text{Volumetric Flask})}{100.00\text{mL}}$$

Note: we assume that there is no uncertainty in the molecular weight.

(II) % Inherent error for solution 2:

$$[\text{Solution 2}] = \frac{[\text{Solution 1}] * \text{Pipet Volume}}{\text{Total Volume of Solution 2}}$$

$$\frac{\Delta [\text{Solution 2}]}{[\text{Solution 2}]} = \frac{\Delta [\text{Solution 1}]}{[\text{Solution 1}]} + \frac{\Delta (\text{Volumetric Pipet})}{10.00\text{mL}} + \frac{\Delta (\text{Volumetric Flask})}{100.00\text{mL}}$$

Note: $\frac{\Delta [\text{Solution 1}]}{[\text{Solution 1}]}$ = inherent error for solution 1.

You will need to continue to propagate the error for the remaining solutions until you reach the final inherent error for the very last solution.

Refer to the procedures in the manual and your lab notebook for the specific volumes of pipet and volumetric flask that you use in each step.

Note: The term $\Delta [\text{Solution 1}] / [\text{Solution 1}]$ or $\Delta [\text{Solution 2}] / [\text{Solution 2}]$ is often referred to as inherent error in the lab manual. It is often expressed in %. It is sometimes also refer to as relative error or % relative error. There is NO unit associated with inherent error or relative error.