

PHY 122 LAB 2: Error Propagation - Volumes

Introduction:

The purpose of this experiment is to make use of what you have learned from Lab 1 about mean and standard deviation, absolute and relative (percentage) errors, significant figures, and the rules for addition, subtraction, multiplication and division of errors that applies to all kinds of experimental measurements. These are all described in the handout “Lab0-DataAna”.

Procedure:

In this lab, we will measure the volume of various shaped objects, using Vernier calipers. You should estimate each measurement to $\pm X.XX$ mm. Take several independent readings for each length measurement, say 2 for each partner (so everyone learns to use the calipers), then take the mean and standard deviation of these readings.

Find the volume of each of the following objects. Express your answer in cm^3 .

1. A rectangular volume.
2. A triangular volume.
3. A hollow cylinder.
4. A bullet shape object, approximated as a cylinder plus hemisphere.
5. A small plastic cup. Estimate the volume of the cup by finding the volume of water that fills a regular shape (rectangular box).

Report:

Your abstract need only state the result for the “bullet-shaped object”.

Lab Evaluation Sheet

Please return this sheet with your lab report (detached). Name is optional.
Rank this lab on the following topics using a scale of (1=most, 5 = least).

Lab Course (122 or 132)_____

Lab # _____

1. Fun (1 2 3 4 5)

2. Difficult (1 2 3 4 5)

3. Clear (1 2 3 4 5)

4. Instructive (1 2 3 4 5)

5. Estimate the time that you spent writing this report: _____ hours.

Additional comments or suggestions:

Lab Quiz (You must show your work, to get proper credit!)

1. Find the area of a flat piece of metal according to the data in the table below for the length of each side. State the answer as mean $\pm \sigma_m$ units. eg Area = $3.2 \pm 0.2 \text{ cm}^2$. Since you now understand the “mechanics” of finding σ_m you may use any computing accessory you wish.

Side X (cm)	Side Y (cm)
8.4	6.3
8.6	5.9
8.3	6.2
8.7	6.5
8.5	6.3
8.8	6.1

2. Find the volume of a right cylinder with measured dimensions of:
diameter $d=3.2 \pm 0.2 \text{ cm}$
height $h=12.6 \pm 0.2 \text{ cm}$.