

Lab 1

Uncertainties in measurements – Density

Lab Partners

Date

Introduction
explain what you are going to do and how

In this experiment the density of a piece of metal will be calculated by measuring mass and volume. The piece of metal is rectangular and has a circular hole in the center. The mass will be measured with a triple beam balance and the volume will be determined by measuring the dimensions of the piece of metal with a ruler.

Body
Include data, diagrams, calculations, tables, graphs, calculations, and **explanations**

Mass = 247.250 g \pm 0.005 g



L = 15.21 cm \pm 0.05 cm

W = 4.99 cm \pm 0.05 cm

H = 1.21 cm \pm 0.05 cm

D = 2.49 cm \pm 0.05 cm

The absolute uncertainties in the above measurements are equal to the smallest division on the scale of the measuring device.

The volume of the piece of metal can be determined by subtracting the volume of the cylindrical hole from the volume of the rectangular piece.

(Show calculations here. Include calculations for uncertainties.)

The density of the metal is calculated by using the definition of density.

$$\text{Density} = \text{Mass}/\text{Volume}$$

(Show calculations here. Include calculations for uncertainties.)

The appearance of the sample resembles that of aluminum. To identify the composition of the sample, the density obtained from this experiment is compared with the known density of aluminum as recorded in our physics textbook.

Known density of aluminum = 2.70g/cm³

To compare the two values, both numbers must be expressed in the same set of units.

(Show calculations for conversion of units here.)

(Show % error calculations here)

Conclusion

Report final numerical results with percent uncertainty and, if appropriate, percent error. Interpret the results. If you have suggestions for improving the experiment, include them here.

According to our measurements, the density of the piece of metal is $2.88\text{g/cm}^3 \pm 6.4\%$. Comparing this with the density of aluminum yields a percent error of 6.7%. Since the percent error is larger than the percent uncertainty, we conclude that the metal is not made of pure aluminum.

Since most of the uncertainty is due to measuring the volume, the results could be improved by using a vernier caliper instead of a ruler to determine the diameter of the hole. Alternatively, the volume could be determined using water displacement method.