

## Lab #2      Error in Measurements / Density

### Lab Goals:

- to determine the range and precision of an instrument
- to practice recording measurements in correct significant digits and computing error estimates
- to measure the density of a substance

### Lab Procedure:

#### Part 1 – Error Analysis

- 1) Determine the range and precision of your instrument. Record results in lab notebook.
- 2) Measure the length and width of the board. Record your results in the Data Table 1. Do not tell your results to others in the class.
- 3) Do appropriate calculations to complete in the Data Table 1. These include the following:
  - area of the board
  - average measurement for length, width, and area
  - range of measurements for length, width, and area
  - absolute error for length, width, and area
  - mean deviation for length, width, and area
- 4) State final result for the length, width, and area of the board.

#### Part 2 – Density

Calculate the density of two samples.

Be sure to record the range and precision of the instruments used.

Describe your procedures including formulas used.

Compare your results to the table of mass densities in this lab.

### Questions for Lab Summary:

#### Part 1

- What information can you obtain from the absolute error? Which measurement had the greatest absolute error? the least?
- What can you learn about the final result from the mean deviation? Why is this important?

#### Part 2

- Define density.
- How closely did your density measurements agree with the accepted values? What might have caused them to differ?

**Sample Data Table 1:**

Name & instrument	Length	Width	Area
1.			
2.			
3.			
average			
range of data set			
absolute error	$E_a$	$E_a$	$E_a$
1.			
2.			
3.			
mean deviation			

Final Result of Length of the board: \_\_\_\_\_

Final Result of Width of the board: \_\_\_\_\_

Final Result of Area of the board: \_\_\_\_\_

Table of mass densities at 1 atm of pressure and at 0°C

Material	Density (g/cm <sup>3</sup> )	Specific gravity
Aluminum, Al	2.70	2.70
Brass	8.70	8.70
Copper, Cu	8.92	8.92
Gold, Au	19.3	19.3
Iron, Fe	7.86	7.86
Lead, Pb	11.3	11.3
Nickel, Ni	8.68	8.68
Platinum, Pt	21.4	21.4
Silver, Ag	10.5	10.5
Tin, Sn	7.29	7.29
Zinc, Zn	7.14	7.14