Laboratory Investigation Name _____

Chemistry: Form L1.4A Date _____ Period _____

Working With Significant Figures

PROBLEM

What limits the accuracy of measurements?

INTRODUCTION

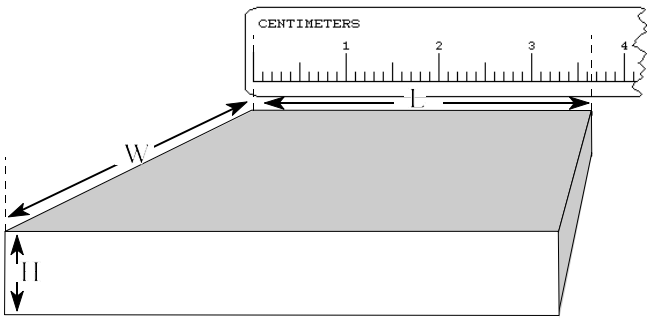
The number of figures that are certain in a measurement are limited by the smallest interval of the measuring device. It is possible to estimate one additional decimal place beyond the figures that are certain. The last decimal place is always considered an estimate. In this laboratory investigation, you will measure the dimensions of two blocks composed of the same type of wood. Then, you will determine the density of the blocks to the correct number of significant figures. Finally, you will determine the percentage error by comparing your measurements.

MATERIALS (*per group*)

Balance; ruler; wood blocks

PROCEDURE

1. Measure the dimensions of a wood block in centimeters with a metric ruler. Remember to use the correct number of significant figures. (Estimate one figure beyond the smallest measurement interval of the ruler. In the example pictured to the right, the length of the block is 3.65 cm.) Record your observations in the data table on the next page.



2. Using a balance, measure the mass of the wood block in grams. Record your observations in the data table on the next page. Use the correct number of significant figures.

3. Repeat steps 1 and 2 using a different block made from the same type of wood.

4. Calculate the volume of each of the wood blocks by finding the product of the length, width, and height ($V = L \times W \times H$). Round off to the correct number of significant figures. Record the results in the data table on the next page.

5. Determine the density of each wood block by dividing its mass by its volume ($D = m/V$). Round off your answers to the correct number of significant figures. Record the results in the data table on the next page.

6. Find the absolute error by determining the difference between the densities of the two wood blocks. Record the result in the data table on the next page.

V_L = larger value
V_S = smaller value
E_A = absolute error

$$E_A = V_L - V_S$$

7. Find the percentage error by dividing the absolute error by the larger value and multiplying by 100%. Using the larger value gives **you** the benefit of the doubt, resulting in the smallest percentage error. Record the result in the data table below.

V_L = larger value
E_A = absolute error
$E_{\%}$ = percentage error

$$E_{\%} = \frac{E_A}{V_L} \times 100\%$$

OBSERVATIONS

Block	1	2
Length		
Width		
Height		
Volume		
Mass		
Density		
Absolute error		
Percentage error		

CONCLUSIONS

1. Why must calculations be rounded off to the correct number of significant figures? ___

2. Think of your percentage error as points off on a test. Is your percentage error large or small? Justify your response. _____

3. What are some sources of error in this investigation? _____

4. How could the amount of error in this investigation have been reduced? _____

5. Why is some error of measurement unavoidable? _____