Name: Jason Wilcox

Pre-Laboratory Activity — *Length and Area*

17/20

Materials (for each lab group):

Calculator

Metric ruler, 0.1 cm markings

Procedure:

Reading the Metric Ruler

1. Obtain a metric ruler. Take a close look at the markings on the ruler. What is the distance between the smallest markings on the ruler?

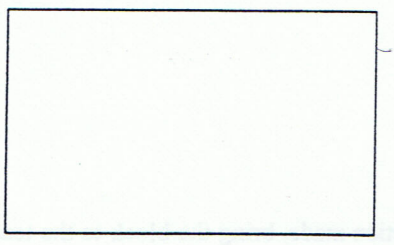
2. It is generally accepted that scientific measurements can be estimated to one-tenth of the smallest mark on the instrument. Therefore, if a ruler has a marking every 1 cm, a person can reliably estimate to the nearest 0.1 cm. Likewise, if a ruler has a marking every 0.1 cm, a person can reliably estimate to the nearest 0.01 cm. With the metric ruler provided by your instructor, what is the most reliable estimation that can possibly be made?

3 Use the metric ruler to measure the length of the following line segments. Be sure to estimate to the hundredths place for each measurement. Be sure to include the appropriate units for length. Underline the digit that you estimated while measuring.

Measure these Line Segments	*Measurement*
a. _____	2.8cm
b. _____	1.4cm
c. _____	3.7cm

Applying Significant Figures in Calculations

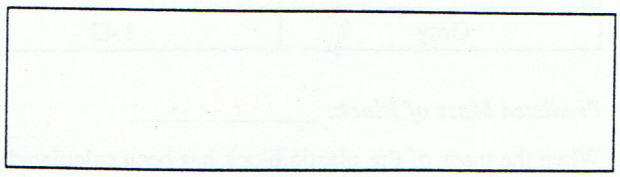
4. Use the metric ruler to measure the length and width of each of the rectangles below. Be sure to estimate to the proper decimal place for each measurement and to include units with each measurement. Underline the digit that you estimated while measuring.



Rectangle #1

Length: 4.9cm

Width: 3cm



Rectangle #2

Length: 8.1cm

Width: 2.1cm

5. To calculate the area of the rectangles, multiply the length by the width. Round the area values to the proper number of significant figures. Be sure to include the appropriate units for area.

Area of Rectangle #1: 14.7

Area of Rectangle #2: 17

units? cm^2

IN5939

Name: Jason Wilcox

Experiment #1 — *Density Calculation*

Materials (for each lab group):

Balance

Calculator

Metric ruler, 0.1 cm markings

Plastic blocks, 3

Procedure:

Note: Success of this laboratory activity depends on the ability to take accurate measurements, to make valid estimations, and to apply rules for significant figures in mass and volume (and density) calculations.

1. Obtain a plastic block from the teacher. Record the block number and color of the block in the table below.
2. Use the laboratory balance to measure the mass of the block. Record the mass in the data table.
3. Use the metric ruler to measure the dimensions of the block. Record these values in the data table.
4. Calculate the volume of the block using Equation 1 from the background information. Round the answer to the proper number of significant figures. Record the volume in the data table. Be sure to include the appropriate units.
5. Calculate the density of the plastic block using Equation 2 from the background information. Record the density in the data table. Be sure to include the appropriate units.
6. Repeat steps 1–5 for two additional blocks, being sure to obtain blocks of different colors. Record all data in the table below.
7. Check with your instructor to determine the accuracy of your measurements and calculations.

Data Table:

Block Number	13	15	**21**
Color of Block	Dark Grey	Dark Grey	Black
Mass (g)	100.22g	97.3g	97.94g
Length (cm)	6.7cm	8.1cm	7.2cm
Width (cm)	4.2cm	5.2cm	3.4cm
Height (cm)	2.5cm	2.5cm	2.6cm
Volume (cm^3)	70.35cm^3	105.3cm^3	56.9cm^3
Density (g/cm^3)	1.42g/cm^3	0.9g/cm^3	1.72g/cm^3

Name: Jason Wilcox

Experiment #2 — *The Measurement Challenge*

Materials (for each lab group):

Balance
Calculator
Metric ruler, 0.1 cm markings
Plastic block

Procedure:

Note: Success of this laboratory activity depends on the ability to take accurate measurements, to make valid estimations, and to apply rules for significant figures in mass and volume (and density) calculations.

1. Obtain a plastic block from the teacher. Record the block number and color of the sample. The block number must be different from any of the block numbers used in Experiment #1.

   Block Number: 10 ***Color of Block:*** paper white

2. Measure the dimensions (length, width, and height) of the block. Be sure to estimate all measurements to the correct decimal place and to include units with each measurement.

   Length: 10.1cm ***Width:*** 5.3cm ***Height:*** 1.2cm

3. Calculate the volume of the block using Equation 1. Round the answer to the proper number of significant figures. Record the volume in the data table. Be sure to include the appropriate units.

   Volume: 64.24cm^3

4. Use the known density value and the volume calculated in question 3 to predict the mass of the plastic sample. The known density values for each different type of colored plastic are shown in the table below. The density equation can be rearranged to solve for mass as shown in Equation 3.

show your work

Color of Block	Density (g/cm^3)
White	0.541
Black	0.985
Milky-white	0.908
Clear	1.18
Gray	1.42

Predicted Mass of Block: 58.34g

5. When the mass of the plastic block has been calculated and a prediction made, bring the block to the teacher. The teacher will measure the actual mass of the block using a laboratory balance.

   Actual Mass Measurement: 63.19g ***Teacher Initials:*** tP
   (To be filled in by the teacher)

6. Determine the accuracy of the mass calculation by comparing the predicted (calculated) mass with the actual (measured) mass. Calculate the percent error (or difference) in the mass calculation using the equation below. (Or the teacher will perform the error calculation at the balance right in front of the student. Instant feedback!)

$$\text{Percent Error} = \frac{|\text{Calculated Mass} - \text{Actual Mass}|}{\text{Actual Mass}} \times 100 =$$

Percent Error = 7.68%

show your work