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Date: 6/4/2018

Course: Physics 1111L

Partner: Julia Thompson

Lab: Lab 1 Report

Professor: Harrison

Grade:

**1) Objective:**

a. The goal was to get familiarized with lab tools and utilizing formulas to find the surface area, volume, and density of various shapes and determine the uncertainty of the measurements with SageMath.

**2.) Theory:**

a. Students are expected to find the surface area, volume, and density while understanding the uncertainty found in measuring different objects.

b. Variables:

i.h= height

ii.w= width

iii.l= length

iv.

v.r = radius

vi.SA = surface area

vii. V= volume

viii.D= density

ix.

x.

c. Formulae:

i.Rectangular Prism Surface Area Equation

1.

ii.Rectangular Prism Volume Equation

1.

iii. Sphere Surface Area Equation

1.

iv. Sphere Volume Equation

1.

v. Cylinder Surface Area Equation

1.

vi.Cylinder Volume Area Equation

1.

vii. Density Equation

1.

viii. Error for Surface Area and Volume

1. *SageMath link attached in comments*

**3)** **Procedure:**

1. Part 1

i.Determine the mass of each object using an electronic balance in grams and record the results.

ii.Determine the dimensions of each object with calipers in centimeters and record the results.

iii. Determine the surface area, and volume by utilizing the formulas. Find the density of each object by dividing the mass of each object by the volume. Then propagate the error and report the error bar using SageMath.

iv. Use available resources to identify the material of the objects.

**4)** **Data:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Object | Rectangular Prism | Hollowed Cylinder | Sphere | Cylinder |
| Mass (grams) | **42.6** | **103.4** | **44.6** | **16.4** |

|  |  |
| --- | --- |
| Object | Dimensions (cm) |
| Rectangular Prism | Length: **2.5**  Width: **1.2**  Height: **4.8** |
| Hollowed Cylinder | Diameter: **1.9**  Length: **6.2**  Center Length: **4.9**  Inside: **0.5** |
| Sphere | Diameter: **2.2** |
| Cylinder: | Height: **2.2**  Diameter: **1.1** |

**5)** **Calculations:** *(attached to the back of this report)*

**6)** **Results:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Object | Surface Area (cm^2) | Volume (cm^3) | Density (g/cm^3) | Surface Area Error (cm^2) | Volume Error (cm^3) |
| Rectangular Prism | 41.5 | 14.4 | 2.96 | 1.01 | .680 |
| Sphere | 15.2 | 5.58 | 8.00 | .440 | .760 |
| Cylinder | 9.50 | 2.09 | 7.85 | .150 | .380 |
| Hollowed Cylinder | 13.7 | 58.6 | 7.53 | .260 | 2.00 |

**7) Analysis:**

1. In conclusion, It seems that the object with the lowest surface area has the lowest surface area error and the object with largest volume has the largest volume error. There is a direct relationship between these variables.

**8)** **Comments:**

1. It was a successful lab. There wasn’t any issues or any major problems my lab partner and I came across. It was determined that the material of the rectangular prism was made of were lead due to the density of the metal being 2.7 g-cm^3. The sphere was made of nickel due to density being 8.9 g/cm^3. The two cylinders being made of iron with a density of 7.8 g/cm^3.

Links:

a). SageMath Link

<https://ungphysics.github.io/1111-harrison/>

b). Density Determining Link

<http://periodictable.com/Elements/013/index.html>