Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Time:\_\_\_\_\_\_\_\_\_\_\_

Partner(s):\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Course:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   
Measurement of density

Purpose: To determine the densities of various solids and water.

Common Theory:

 

A. Rectangular Solids

Apparatus: Electronic balance, foot ruler, rectangular solid metals- Al, Cu, Brass, and Fe; plastic block, and wood block.

Theory:           Volume = Length x Width x Height.

Metal Blocks: Observe and feel the four metal blocks and make three statements about them.

1.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

You have four metal blocks of the same dimensions. Two of the dimensions are small and they need to be measured accurately. Discuss with your group and come up with a method to measure these dimensions. Check with the instructor about your method and describe it below.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Data Table I:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Metal | Mass | Length | Width | Height |
| Al | - | - | - | - |
| Cu | - | - | - | - |
| Fe | - | - | - | - |
| Brass | - | - | - | - |
| Plastic block | - | - | - | - |
| Wood block | - | - | - | - |

Enter the above data in a spread sheet program and calculate volume and density. Also enter the accepted densities, and calculate the %Error. If the %Errors are high, check your measurements. Keep your spread sheet.

Accepted densities (in gm/cm^3):

Aluminum = 2.70    Copper   = 8.90     Iron     = 7.85        Brass    = 8.40   
Steel    = 7.80        Gold       =19.30     Lead     =11.30     Nickel   = 8.75   
Platinum  = 21.54    Silver      =10.5       Zinc      = 7.10        water    = 1.00   
Wood  = 0.64        Plastic (Acrylic) = 1.2

B. Cylinders

Apparatus: Metal cylinders: Cu, Fe, Steel, Brass, and Al; and wood cylinder, electronic balance, and foot ruler.   
    
Theory:   

Data Table II:

|  |  |  |  |
| --- | --- | --- | --- |
| Cylinder | Mass | Height | Diameter |
| Al | - | - | - |
| Steel | - | - | - |
| Cu | - | - | - |
| Brass | - | - | - |
| Fe | - | - | - |
| Wood | - | - | - |

Enter the above data in your earlier spread sheet, below  Data Table I, and calculate radius, volume, and density. Also enter the accepted densities, and calculate the %Error. If the %Errors are high, check your measurements. Print a hard copy of your entire spread sheet with both tables in landscape orientation.

C. Density of Water

Apparatus: Graduated cylinder, electronic balance, and water.

Procedure:

1. Measure the mass of a graduated cylinder in grams (use the electronic balance), and record it on the data table.

2. Fill a small amount of water and measure the mass of graduated cylinder and water.

3. Determine the volume of water.

4. Repeat 1-3, by adding water, 9 more times.   
    
    
 DATA Mass of the graduated cylinder = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| Mass of cyl + water | Volume of water |
| - | - |
| - | - |
| - | - |
| - | - |
| - | - |
| - | - |
| - | - |
| - | - |
| - | - |
| - | - |

Enter the above data in Excel and create two more columns and calculate the mass of water and density of water.   
Discuss with your group to find out what graph should be plotted in order to obtain   
the density of water as the slope. Plot that graph and obtain the density of water from the graph. Print a hard copy of your data table and graph.

Density of water from your plot = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Write a combined conclusion for the entire lab on a separate last page.