**Overview**

Density is a very important property of matter and can be used to identify what substance an object is made of. For example, jewelers use density to tell fake jewels from real jewels; Density is the best way to tell real diamonds from fake zirconium diamonds.

Density is measured in grams per cubic centimeter (g/cm3) and can be calculated using the equation:

**Density = mass / volume**

Density of different materials can be compared and determined from the slope of a line graph of mass vs. volume.

**Measurement and Data Collection**

Use the procedure described by your teacher to collect the following density information:

**Density of Copper**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Copper Sample** | **Mass (g)** | **Volume Using a Graduated Cylinder** | | | **Calculated Volume** (Volume = L x W x H) | **Density** (D = m / v) |
| Before (cm3) | After (cm3) | Difference (cm3) |
| Sample #1 |  |  |  |  | -------------------------- |  |
| Sample #2 |  |  |  |  | -------------------------- |  |
| Sample #3 |  | -------------- | -------------- | ----------------- |  |  |
| **Average Density of Copper:** | | | | | |  |

**Density of Aluminum**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Aluminum Sample** | **Mass (g)** | **Volume Using a Graduated Cylinder** | | | **Calculated Volume** (Volume = L x W x H) | **Density** (D = m / v) |
| Before (cm3) | After (cm3) | Difference (cm3) |
| Sample #1 |  |  |  |  | -------------------------- |  |
| Sample #2 |  |  |  |  | -------------------------- |  |
| Sample #3 |  | -------------- | -------------- | ----------------- |  |  |
| **Average Density of Aluminum:** | | | | | |  |

**Analysis**

1. Graph a scatter plot of Mass vs. Volume for your copper samples.
2. Draw a straight line of "best fit" for your graph. (Ask your teacher about lines of best fit.)
3. Graph your data points for aluminum on the same graph as above and draw a second line of best fit.
4. Bonus: Calculate the slope of each line of best fit. Hint: slope = rise / run. (Ask your teacher about slopes of lines.)
5. Bonus: Compare the slope of each line to your average density for copper and aluminum. Is it a coincidence that they are the same (or very similar)?
6. Graph the data points given below for the unknown material . Use the same graph as for copper and aluminum and draw a third line of best fit.

|  |  |  |
| --- | --- | --- |
| **Sample Number** | **Mass (g)** | **Volume (cm3)** |
| Sample #1 | 12.0 | 1.5 |
| Sample #2 | 24.0 | 3.0 |
| Sample #3 | 36.0 | 4.5 |

1. Predict if the unknown material is copper or aluminum. Use your graph and density calculations to justify your answer.

**Teacher Notes:**

Copper = 8.92 g/cm3 Aluminum = 2.70 g/cm3