**Density Identification Set Lab**

**Background:**

Density is defined as mass per volume OR density= mass/volume. It is typically measured in g/mL or g/cm3. Two objects identical in size can have a different mass—this is explained by the concept of density. Weight is the result of mass being acted on by gravity. The reason we can weigh a sample and call it mass is because gravity is a constant and will be uniform for every measurement.

For the purposes of our lab, we will need to convert from mL to cm3. It’s an easy conversion:

1 mL= 1 cm3

**Equipment Needed:**

* Balance accurate to 0.1 g
* Calculator
* Graduated cylinder (approximately 25 mL)

**Procedure:**

1. Determine the mass of each sample. Record the measurement in the column labelled “Mass”. Each sample has a number on the bottom, so enter the data in the appropriate row. Remember to record the mass in grams.
2. Determine the volume of each sample. This involves several steps:
   1. Fill the graduated cylinder up to the 10-15 mL mark and record this measurement to the nearest 0.1 mL in the “Water level initial” column.
   2. Carefully place the sample in the graduated cylinder. If water splashes out, remove the sample and take a new “Water level initial” measurement. It helps to hold the graduated cylinder at an angle and carefully slide the sample into the water.
   3. Record the new volume of water to the nearest 0.1 mL and record this number in the “Water level final” column.
3. To find the sample volume, simply subtract “Water level initial” from “Water level final” and enter the value in the “Sample volume” column.
4. To calculate density, use the formula D=M/V or density= mass divided by volume. You will use the volume recorded in the “Volume of sample” column. Remember that 1 mL= 1 cm3.
5. Once you have recorded the densities, try to identify the sample by using the chart provided by your instructor. This chart has the known values for each material. Write your result in the column labelled “Sample”.
6. Consider why your results may not have been the same as the chart. What are potential sources of error?

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Sample | **Mass (M)** in grams | Water Level initial (mL) | Water Level final (mL) | **Volume** (V) of sample (mL) | **Density**  M/V  (g/cm3) |
| 1 |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |
| 6 |  |  |  |  |  |  |
| 7 |  |  |  |  |  |  |
| 8 |  |  |  |  |  |  |
| 9 |  |  |  |  |  |  |
| 10 |  |  |  |  |  |  |
| 11 |  |  |  |  |  |  |
| 12 |  |  |  |  |  |  |

If there are some differences between your experimental results and the actual density values, explain possible sources for error.

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**Density Identification Set Answer Key**

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| --- | --- | --- |
| Sample # | Name | Density (g/cm3) |
| 1 | Glass | 2.2 |
| 2 | Copper | 8.8 |
| 3 | Lucite (Acrylic or Polymethylmethacrylate) | 1.2 |
| 4 | Rubber | 1.5 |
| 5 | Delrin (Poly oxymethylene) | 1.4 |
| 6 | Nylon | 1.1 |
| 7 | Aluminum | 2.7 |
| 8 | Brass | 8.3 |
| 9 | Pine | 0.5 |
| 10 | Oak | 0.6 |
| 11 | PVC (Polyvinyl chloride) | 2.1 |
| 12 | Teflon (Polytetrafluroethylene) | 1.4 |