Sample 1025 Density Lab

Purpose:
The purpose of this lab was to measure the densities of several geometrically-shaped objects made of different materials and to compare our experimentally determined density values to known correct values where possible.

Procedure:
We measured the mass of each object (in grams) using a triple beam balance. We also measured the dimensions of each object (in cm) using a vernier caliper. We then calculated each object’s volume (in cm\(^3\)) using the appropriate formulae, and divided each object’s mass by its volume to get its density. Finally, we compared our experimental values for the densities with known correct values and computed a % error in our measurements.

Data:

<table>
<thead>
<tr>
<th></th>
<th>Lead Slab</th>
<th>Brass Cylinder</th>
<th>Zinc Cylinder</th>
</tr>
</thead>
<tbody>
<tr>
<td>l</td>
<td>3.210 cm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>w</td>
<td>1.951 cm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>h</td>
<td>0.182 cm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>m</td>
<td>12.22 g</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V = l x w x h</td>
<td>1.14 cm(^3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exp Density</td>
<td>10.72 g/cm(^3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actual Density</td>
<td>11.4 g/cm(^3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% error</td>
<td>5.96%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Funny shaped thing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same</td>
<td></td>
<td>Same</td>
</tr>
<tr>
<td>Blah</td>
<td></td>
<td>Blah</td>
</tr>
<tr>
<td>Blah</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% difference</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Observations:
I learned how to use a vernier caliper, which can measure lengths with .001 cm precision, and a triple beam balance, which measures mass to 0.1 gram. I learned the difference between percent error and percent difference. Percent error is used when you know the correct answer. Percent difference is used when you don’t know the correct answer, so you just compare two experimental values to see how close they are. My percent errors were all between 3% and 6%, which is larger than I expected. For the cork, we used a percent difference and compared to our neighbors’ values because there was no “correct” value given for the density of cork. Given the precision of the instruments we used, I expected our errors to be less than 1%. However, the specimens we were given were not perfect cylinders or cubes, and so our experimental values for the volumes were probably off. The teacher made a big stink about the fact that density is not a unique identifier. In other words, just because a material has the same density as zinc does not mean that the material is zinc.