Will It Float or Sink?

Will a rock float in water? Will a cork float in alcohol? Will alcohol float on glycerine? In this investigation, you will predict whether various solids will float or sink in three liquids. Then you will test your predictions. You will also predict and test what will happen when you combine the three liquids.

Question

Which materials will float or sink in rubbing alcohol, water, and glycerine?

Materials

- safety goggles
- apron
- small pieces of various solids (such as cork, wood, and rock)
- ruler
- graduated cylinder
- balance
- 3 250-mL beakers or small glass jars
- rubbing alcohol (isopropyl alcohol, density 0.8 g/mL)
- water (density 1.0 g/mL)
- glycerine (density 1.3 g/mL)
- 3 colours of food colouring

Procedure

1. Calculate the density of each solid. You may have to use indirect measurement to determine the volumes of some of the solids.

Record the densities in your notebook in a table like the one below.
Analyze and Evaluate
1. Summarize your results in a few sentences.
2. Explain how you can use density to predict whether or not one substance will float on another substance.

Apply and Extend
3. Which substance that you tested is the most dense? Which is the least dense? Give one use for each substance that relies on its density.
4. In the last step of the procedure, you combined different liquids. Describe the final appearance of the combined liquids. What can you conclude about the densities of the three liquids?
5. **Table 2** gives the densities of several metals. Mercury is the only metal that is a liquid at room temperature. Mercury is very toxic. You should never touch it or inhale its vapours. Use **Table 2** to determine which metals would float and which would sink in liquid mercury (Figure 1).

![Figure 1](image)

*Figure 1*
Mercury is a silvery-white, liquid metal.

<table>
<thead>
<tr>
<th>Metal</th>
<th>Density (g/mL or g/cm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>aluminum</td>
<td>2.7</td>
</tr>
<tr>
<td>chromium</td>
<td>7.2</td>
</tr>
<tr>
<td>copper</td>
<td>8.95</td>
</tr>
<tr>
<td>gold</td>
<td>19.3</td>
</tr>
<tr>
<td>iron</td>
<td>7.86</td>
</tr>
<tr>
<td>lead</td>
<td>11.34</td>
</tr>
<tr>
<td>mercury</td>
<td>13.6</td>
</tr>
<tr>
<td>silver</td>
<td>10.5</td>
</tr>
<tr>
<td>tin</td>
<td>7.31</td>
</tr>
<tr>
<td>zinc</td>
<td>7.13</td>
</tr>
</tbody>
</table>

**CHECK YOUR UNDERSTANDING**

1. How could mistakes in your measurements or calculations have affected the accuracy of your predictions?
2. Could the food colouring you added to the liquids in step 5 have affected the densities of the liquids? Explain.