## Density of Glass Fragments

Topics covered: Density, Measurement, Sig Figs, Percent Error, Precision and Accuracy, Physical Properties, Descriptive Chemistry, Archimedes Principle, Writing skills

*A stolen car crashed head on into a minivan. The driver of the minivan sustained serious injuries. The driver of the stolen car leaves the scene of the crash before police arrive. Three blocks away, a jogger discovers a man, bleeding from a cut on his forehead. As a concerned citizen, the jogger calls for help. There are glass fragments in the wound. The man, Otto Heist, claims that he was not the driver of the stolen car involved in the accident. He is transported to the local hospital where several pieces of glass are removed from his wound. Back at the crime scene, officers are collecting evidence. They collect several pieces of glass from the windshield.*

*Your job is to determine if the glass fragments in Otto's head wound match the glass fragments from the scene of the accident.*

*Density determinations can be done to link Heist to the scene, and make him a suspect open to further investigation.*

**Equipment**:

Known glass samples
Unknown glass samples
Balance
String
Scissors
Beaker

**Procedure**: *Careful measurement is the key*

1. Obtain a balance, piece of fine string, and a 250 mL beaker
2. find the mass of a piece of glass to the nearest .01 g
3. Tie the string around the piece of glass
4. Fill the beaker nearly full of water. Record the mass.
5. Place the piece of glass in the beaker, adjusting the height so that it is not touching the sides or bottom of the beaker.
6. Record the new mass
7. Find the difference in mass—this is the volume of the glass (because the density of water is 1 g/mL).
8. Repeat this process for all the known samples of glass and the unknown.
9. Calculate the density of each piece of glass.
10. Identify your unknown.

**Data**:

Unknown Letter: _____

| Sample | Mass of glass | Init mass $H_2O$ | Final mass $H_2O$ | Volume of glass* | Density* |
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Calculations: (*=calc required)

It was determined through careful analysis, that the density of the unknown sample _____ matched the density of the sample found at the crime scene, thus Otto Heist is/is not a suspect in the case.