Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Pd: \_\_\_\_\_ Ast:\_\_\_\_\_

**CSI Lab**

**Introduction:**

You are a lab technician for a group of crime scene investigators. While searching the main suspect’s house, an investigator found several strange objects that appear to match similar objects found at the crime scene. The investigators have asked you to analyze the samples to see if they are made from the same substance. To do this, you must **compare the properties**, or characteristics, of the samples. Each substance has a unique combination of properties which can include (but are not limited to) texture, hardness, shape, color, size, mass, volume, odor, conductivity, flammability, etc…

One very important property used to identify matter is called “density”. **Density** is a measure of how much mass is contained in a specific volume, in other words, how many grams of matter are present in one cm3 (or mL) of space (grams per cubic centimeter, or g/cm3). The density of a substance remains consistent for all samples of that substance, independent of the amount (mass or volume). Each substance has its own characteristic density, which can be useful in classification.

**Task:**

Provide a thorough analysis of the samples for the investigator. Conclude whether the samples found at the crime scene and the suspect’s house are made of the same substance. If you determine that they are, this can link the main suspect to the scene of the crime giving the investigator cause to make an arrest (*note: This does not mean the suspect is “guilty”.*). If you determine that they are not, this may help to clear an innocent man (*note: This does not mean the suspect is “innocent”.*).

Remember, your role is not to determine guilt or innocence, only to use science to link a suspect to the crime scene.

*Note: To eliminate bias, the investigator has mixed up the samples so that you will not know before-hand which samples were found at the crime scene and which were found at the suspect’s house.*

**Guiding Question**:

**Are the samples from the suspect’s house and the crime scene made of the same substance?**

**Materials:**

You will have access to the following materials during your investigation:

* 12 Samples (some from the crime scene, some from the suspect’s house)
* Rulers
* Digital Scales
* Helpful equations:
	+ **Volume of a Cylinder =** $\frac{πd^{2}h}{4}$ **=** $πr^{2}h$
	+ **density =** $\frac{m}{V}$

**Getting Started:**

Use the back of this paper to organize and analyze your data.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **sample** | **mass (g)** | ***diameter (cm)*** | ***height (cm)*** | **volume** **(cm3)****v** $=\frac{πd^{2}h}{4}$ | **density (**$\frac{g}{ cm^{3} }$**)****d =** $\frac{m}{V}$ |
| **1** | **11.4 g** | 1.6 cm | 4.1 cm | **8.24 cm3** |  |
| **2** | **10.7 g** | 1.6 cm | 4.6 cm | **9.25 cm3** |  |
| **3** | **14.2 g** | 1.6 cm | 5.1 cm | **10.25 cm3** |  |
| **4** | **13.1 g** | 1.6 cm | 5.6 cm | **11.26 cm3** |  |
| **5** | **17.1 g** | 1.6 cm | 6.1 cm | **12.26 cm3** |  |
| **6** | **15.5 g** | 1.6 cm | 6.7 cm | **13.47 cm3** |  |
| **7** | **20.0 g** | 1.6 cm | 7.15 cm | **14.38 cm3** |  |
| **8** | **17.7 g** | 1.6 cm | 7.65 cm | **15.38 cm3** |  |
| **9** | **22.9 g** | 1.6 cm | 8.2 cm | **16.49 cm3** |  |
| **10** | **20.1 g** | 1.6 cm | 8.7 cm | **17.49 cm3** |  |
| **11** | **25.7 g** | 1.6 cm | 9.2 cm | **18.50 cm3** |  |
| **12** | **22.6 g** | 1.6 cm | 9.7 cm | **19.50 cm3** |  |