**Group 14 Elements: The Carbon Family Lab**

* **Question:** Can the properties of an element be predicted using a periodic table?
* **Introduction:** Density is a useful property for identifying and classifying elements. In this lab, you will determine the densities of three elements in group 14 – silicon (Si), tin (Sn), and lead (Pb). Then you will use your data to predict the density of another element in group 14 – germanium (Ge).
* **Safety:** Goggles, gloves, aprons and closed-toed shoes are required. Lead is poisonous.

**Data Table**

*(Copy into your lab notebook before lab day.)*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Element | Mass (g) | Volume of Water (cm3) | Volume of Water and Element (cm3) | Volume of Element (cm3) |
| Silicon |  |  |  |  |
| Tin |  |  |  |  |
| Lead |  |  |  |  |

Procedure: *(✓ each of the steps as you complete them.)*

**SILICON**

* 1. Place the EMPTY tray labeled “Silicon” on the electronic balance. Press the ZERO button.

2. Place your entire sample of silicon into the tray – just the silicon and all of your silicon. Read and record the mass of the silicon.

* 4. Fill your graduated cylinder about halfway. Read the *exact* volume of the water. Record the volume on your data table. Do not put the graduated cylinder on the electronic balance!
* 5. Tilt the graduated cylinder and carefully pour the silicon from the tray into the graduated cylinder. Make sure that the silicon is completely covered by the water. Do not put the graduated cylinder on the electronic balance!
* 6. Measure and record the *exact* volume of the water and silicon in your data table. Do not put the graduated cylinder on the electronic balance!
* 7. Subtract the Volume of the Water from the Volume of the Water and Element. Record your result on the Data Table as Volume of Element.
* 8. Sieve out your silicon over the sink and put all the pieces on a paper towel folded to fit into your plastic tray.

*(Procedure continued on back.)*

**TIN**

* 9. Repeat procedure except using tin instead.

**LEAD**

* 10. Repeat procedure except using lead instead.
* **Calculations:**
1. Calculate the density of the three elements: silicon, tin and lead. Show all your work. Include all labels and units.

$$Density= \frac{Mass}{Volume}$$

1. Graph your calculations of the densities of group 14 elements on a graph. Use period number for the x-axis.
2. Once you have drawn your graph, interpolate the density of germanium by drawing a dotted vertical line from the 4 on the horizontal axis to your graph line. Then, draw a dotted horizontal line from your graph line to the vertical axis. Read and report the density of germanium in the conclusion sentence.

* **Conclusion:**

*“My experimental calculation of the density of germanium is \_\_\_\_\_\_.”*

EXTRA CREDIT: Calculate your percentage error. The actual density (accepted value) of germanium is 5.3 g/cm3.