Student name: _____ Date: _____

Alchemists Go Fishing With Archimedes

Think about it…

1. Metals such as gold, silver, copper and lead have been known since ancient times. These metals are the metallic elements Au (gold), Ag (silver), Cu (copper), and Pb (lead) found in the Periodic Table of Elements. The metallic element lead exists as a pure metal and in many lead-containing chemical compounds. Lead is also found in combinations of different metals called alloys. Different kinds of lead compounds and alloys as well as pure lead all have different properties. These different properties have made lead useful in many ways. For example, lead's low melting point and ease in being shaped has made it useful in bullets, shot and fishing sinkers. Environmental scientists are concerned that lead from these sources can harm wildlife.

   The properties of pure metals, alloys, and metal compounds depend on what substances they are made of. What properties could you use to tell different metals and metal compounds apart?

   _____

2. Some properties of metals and metal compounds might be easier than others to determine. Density is a property that reflects how the particles in a chemical substance are arranged. What do you already know about density?

   _____

3. What would you like to find out about density?

   _____

4. How could you use density to find out whether fishing sinkers or weights are made of lead or other materials?

   _____

5. What procedure(s) could you use to test your ideas about the density of fishing weights? Be as specific as possible in describing you tests.

6. Use the following pages to organize and summarize your science work.

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Science Research Summary

The investigating scientists are:

_____ _____

_____ _____

Our Question(s) — What we want to find out?

Our Test(s) — How we plan to find out?

We plan the following test:

Our Materials

Our Observations and Data (Results)

We plan to collect the following data:

We organize this data in the following data table to allow us to make a claim:

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Our Claim

From our test (experiment) and data (results) we claim:

Our Evidence

Our claim is supported by the following evidence:

Our Reasoning

Our claim and evidence are linked or supported by the following science reasoning:

Our Readings and Discussions — How do our results fit with what others know or have found out?

Our claim, evidence or reasoning fits because we heard:

Our claim, evidence or reasoning fits because we read:

Our Reflection

After working on this question or test we now know and wonder about:

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The Science Behind Your Investigation

Density, the ratio of mass to volume, is an example of an *intrinsic property*, a property that does not change with the amount of a substance. Density gives us clues about the identity and arrangement of the particles that make up a substance. Consider two substances made up of particles that have a similar mass. In one substance, the particles are more closely spaced and in the other substance more widely spaced. Which substance has the greater density? What if one substance has particles with a greater mass than the other, but the particles in both are spaced about the same? Which of these has the greater density?

If two objects have different densities (under the same conditions of temperature and pressure), we can conclude that the particles inside each are probably different, and that the substances are probably not the same. What if the densities of two objects are the same? They could have the same identity and arrangement of particles and therefore be the same substance. But, they might just have the same mass to volume ratio even with particles of different identities and arrangements. So, while density is a clue, it is not a definitive test.