

Lab Investigation 2 - Are these materials made of the same substance?

AN INTRODUCTION TO PHYSICAL PROPERTIES

Guiding Question

Are the samples provided made of the same material?

INTRODUCTION

A physical property can be observed or measured without changing the identity of the material. This is in contrast to a chemical property which does change the identity of the material. For example, consider the difference between melting iron, which is a physical change, and the reaction of iron with oxygen to form rust, which is a chemical change. Typical physical properties include shape, color, odor, density, hardness, melting point and boiling point. Density is a property that is often used in chemistry because it is a useful conversion factor between mass and volume. Density is also easily measured in the lab and can be used to distinguish different substances.

THE PROBLEM

Matter, the “stuff” of which the universe is composed, has two characteristics: it has mass, and it occupies space. The relationship between these two characteristics is called density. Since density is a physical property of matter, density can be used to determine the identity of a substance. In this investigation you will attempt to identify several unknown samples of matter based on their density.

MATERIALS AVAILABLE FOR USE

Water

Spill Can

Tongs

Graduated Cylinders

Beaker

Top Loader Electronic Balances

Vernier Calipers

SAFETY PRECAUTIONS

CAUTION: Carefully add the samples into the glass cylinders to avoid cracking the glass.

CAUTION: Wear goggles at all times.

GETTING STARTED

You will need to determine a way to gather the data so that you produce evidence that can be used to justify your answer to the guiding question. It is good scientific practice to determine values in more than one way, so you should develop two methods for determining the density of your samples. You will then coordinate these components into an argument that you can use to convince your classmates that your ideas are valid and acceptable.

INTERACTIVE POSTER SESSION

Once your group has completed your work, prepare a whiteboard that you can use to share and justify your ideas. See the interactive poster session¹ document for details on this process.

REPORT

Once you have completed your research, you will need to prepare an *investigation report* that consists of three sections. Your report should answer these questions in 2 pages or less. This report must be typed and any diagrams, figures, or tables should be embedded into the document. Generally, you need one page for the first two sections and the second page for third section.

Section 1: What concept were you investigating? Relate this concept to the guiding question.

Section 2: How did you go about your work and why? This is NOT the details of your procedure, but discussion of the processes. For example, describe the methods for finding volume. Why did you use the spill can?

Section 3: What is your argument? There should be a data table with mass, volume by displacement and by length as well as the density you calculate from these two volume methods. Units and significant figures are important. Discuss the validity and reliability of your data in answering the question. Contrast the values. Compare with the other groups.

¹../poster/manual.html