DETERMINATION OF THE DENSITY OF PENNIES

Materials:

    10 Pennies of the same type (either pre-1980 or post-1980)
    Balance
    50-mL Graduated Cylinder
    Wooden Block

Objective: To determine the densities of several different substances.

Introduction: The mass by itself or the volume by itself does not give us information about the composition of a substance. However, the ratio of the mass to the volume of a substance can be very useful. This ratio is called density. The density of a substance is a specific property of that substance. That is, no matter how much or how little of the material we have, its density is the same. Usually different substances will have different densities.

Procedure:

A.1. Measure and record, in the data table the mass of an empty, dry graduated cylinder. Add water until the cylinder is about half full. Measure the mass of the cylinder plus water and record the mass. Calculate the mass of the water. Record in data table.

  2. Measure and record in the data table the volume of the water in the graduated cylinder to the nearest tenth (0.1) of a mL. Be sure to have your eye level with the water level and read the bottom of the meniscus. Determine the density of the water (Density = mass/volume).

  3. Weigh 10 pennies of the same type (either pre-1980 or post-1980) and record the total mass in the data table. Immerse the 10 pennies in the water in the graduated cylinder. Do not splatter the water on the sides of the cylinder. Read and record the new volume of the water. The difference between the original volume and the final volume is the volume of the 10 pennies. Determine this value and record it in the data table.

  4. Calculate the density of the pennies and record it in the data table.

B.1. Your teacher will give you the values for the mass and volume of 20 pennies. Use these data to calculate the density of the pennies.

C.1. Determine the mass of a rectangular wooden block on the balance and record this value in the data table. Measure the length, height and width of the block in cm and use the formula, V = l x w x h, to determine its volume. Record all these values in the data table. Calculate the density of the wooden block and record this value in the data table. Wood from different types of trees will have different densities. Hardwood, such as oak, is more dense than softwood such as pine.

Application:

1. Compare the two values for the density of the pennies. Do you think that the density of 20 pennies is greater than the density of 10 pennies, or are the densities approximately the same? Compare your values with those of other students.

2. In part 6 (above) you determined the density of a wooden block. What is the mass of a cube of the same wood which measures 1 cm on a side? What is the mass of a similar cube of water?

3. Which would have a larger volume, 5 grams of water or 5 grams of pennies? Explain how you arrived at your answer.

DATA TABLE FOR Section A

Mass of Graduated Cylinder   _____ g

Mass of Graduated Cylinder   _____ g
     Plus Water

Mass of Water   _____ g

Volume of Water   _____ mL

Density of Water   _____ g/mL

Mass of 10 pennies   _____ g

Original Volume of Water   _____ mL

Final Volume of Water   _____ mL
     Plus Pennies

Volume of 10 pennies   _____ mL

Density of 10 pennies   _____ g/mL

DATA TABLE FOR Section B

Mass of 20 pennies   _____ g

Volume of 20 pennies   _____ mL

Density of 20 pennies   _____ g/mL

DATA TABLE FOR Section C

Mass of Wooden Block   _____ g

Width of Block (cm)   _____ cm

Length of Block   _____ cm

Height of Block   _____ cm

Volume of Block   _____ cm3

Density of Wood   _____ g/cm3