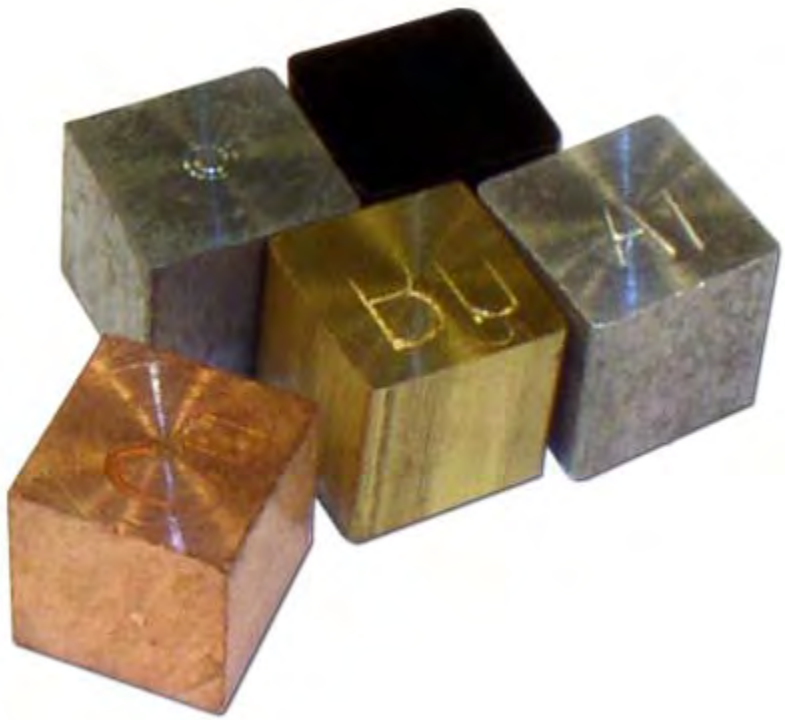
611-2021 (30-025) Cubes of Various Types



Description: Use this kit to determine the densities of five solid cubes of four metals and one alloy (brass) by a water displacement method. The standard for comparing densities is water. At a temperature near 4 °C, water has a density of 1.000000 grams per mL or 0.999973 grams per cubic cm. Densities change with temperature and pressure.

Warranty and Parts:
We replace all defective or missing parts free of charge. Additional replacement parts may be ordered toll-free. We accept MasterCard, Visa, checks and School P.O.s. All products warranted to be free from defect for 90 days. Does not apply to accident, misuse or normal wear and tear. Designed for ages 13 and up. Item is not a toy. It may contain small objects that can be choking hazards.

How to Teach with Cubes of Various Types:
Concepts Taught: Mass; Volume; Density; Specific Gravity; Buoyancy
Curriculum Fit: Physical Science and Chemical Science/Matter. *Unit: Observation and Measurement of Physical Properties.*
Grades 6-8 and up.
Additional Materials Needed:

- Balance
- Graduated cylinder (25 mL) filled with distilled water
- String
- Thermometer

Experiment: Determination of Density by Water Displacement

Procedure:

1. Record the air temperature in the laboratory. Record the value (°C) below.

   Temperature = _____ (°C)

2. Fill the 25 mL graduated cylinder with distilled water to the 15 mL mark.
3. Weigh each of the five cubes using the balance and record their weights below.

   Aluminum (Al) = _____ (g)
   Copper (Cu) = _____ (g)
   Brass (Bu) = _____ (g)
   Iron (Fe) = _____ (g)
   Zinc (Zn) = _____ (g)

4. Tie a piece of string around each cube, so that you are able to suspend the cube in the cylinder full of water.
5. Submerge the aluminum cube in the water and record the final volume (mL) observed. Record in Table 1 below.

Table 1 Volume of Cube

Material	Mass (g)	Initial Volume, Vi (mL)	Final Volume, Vf (mL)	Cube's Volume (mL)
Aluminum (Al)				
Copper (Cu)				
Brass (Bu)				
Iron (Zn)				
Zinc (Zn)				

6. Repeat step 4. for each of the other materials. Be sure to reassess the initial volume in the cylinder before submerging the cube. Record the initial volume in Table 1 above.
7. Calculate the cube's volume (mL) as follows:

   Cube's Volume (mL) = Vf – Vi

   Record the values in Table 1 above.
8. Calculate the density for each material as follows:

   $D = \frac{m}{v}$
   m = mass (g)
   v = volume (mL)

   Record values in Table 2 below.

Table 2 Density of Cube

Material	Density (g/mL)
Aluminum (Al)	
Copper (Cu)	
Brass (Bu)	
Iron (Zn)	
Zinc (Zn)	

9. Compare the values in Table 2 to the densities of the materials at your ambient temperature recorded in step 1. These values can be located in a source such as the CRC Handbook of Chemistry and Physics.

   Note: In order to make very accurate determinations of density, it is necessary to take the temperature of the water and find its exact density from a chemistry handbook. You may wish to expand upon the concepts of this laboratory and perform a follow up experiment.

Optional Demonstration: Density Determination of Sugar Sweetened Cola versus Artifically Sweetened Cola

Materials:

- Sugar sweetened cola can
- Artificially sweetened cola can
- (2) 4,000 mL beaker (or larger size or fish tank)
- Sugar

Procedure:

1. Pass the cola cans around the room and have students make observations about the cola cans. Write the similarities and differences on the classroom board.
2. Fill the two 4,000 mL beakers or one fish tank to a reasonable volume so that water is not overflowing when the cans are placed in the water.
3. Place the artificially sweetened cola can in the water and the sugar sweetened cola can in the water.
4. Students will observe that one can floats while the other sinks. Have a student come to the front of the class to verify that both cans are still sealed.
5. Ask students to explain reasons why one can is floating.
6. The teacher may wish to discuss the following points:
   a. Amount of sugar (g) in sugar sweetened cola versus amount of artificial sweetener (g) in the other cola. Verify using the company's website or by calling the manufacturer of the cola.
   b. Discuss how more matter is crammed into the same volume of space (12 oz. can) and this affects the density (D = M/V) of the sugar sweetened cola, thus causing it to sink.
7. The teacher may wish to weigh the cans to determine their masses and then perform a volume displacement experiment in order to determine the densities of each can.

Related Products:

Science First® *is a designer and manufacturer of hands-on science labs. Our products are available from most science education distributors. For more information contact us.*

611-2020 Metal Density Cubes - Here are handy, low-cost sets of one-inch cubes that can be used in many experiments. What makes them unusual? They offer an array of materials we actually use today. Learn about density, mass, volume, buoyancy, specific gravity and flotation while experimenting with real-world building materials. Grades 6-8 and up.

611-2000 Density Identification Kit - It's a puzzle - it's a lab - it will separate the sheep from the goats. Ask your class to identity each of twelve (12) different samples by determining their density. Each cylinder varies in size and density since it is constructed of a different material. All are 1/2" cm in diameter and range between 4 and 7 cm in length. Includes: 12 samples, an attractive wood storage rack coated in linseed oil for protection from wet specimens, instructions. The samples include: **aluminum, brass, copper, acrylic, pyrex, rubber, nylon, PVC, PTFE, Tecaform, poplar, and oak.**

611-2125 Accent What is Density? Kit - What is Density, anyway? With this colorful kit, you can easily help your students grasp this concept in a non-mathematical way. By constructing cubes made from magic dough, toothpicks and blue foam floats, you can show how changing the "compactness" of the design influences the cubes' "floatability" when placed in a tray full of water.
Kit includes:
(12) cans of magic dough, (1) box of toothpicks, (300) blue foam squares, (12) clear plastic containers, (1) Density Identification Kit, and instructions