Assorted Density Blocks Set

P1-1010

INSTRUCTIONAL GUIDE

Contents

Six 2 cm cubes in storage box. From least to most dense:

- Aluminum
- Zinc
- Iron
- Brass
- Copper
- Lead

Recommended for activities:

- Ruler (06-0040), Caliper (01-1020), or Micrometer (P1-1040)
- Scale (02-7500)
- Overflow Can (P1-2500)
- Graduated Cylinder (17-0100-01)

Experiments

Density is the ratio of an object's mass to its volume:

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

Mass can be measured with a triple-beam or electronic balance. Volume can be found in two ways, by direct measurement or by displacement.

1. **Direct measurement:** These metal cubes make it easy to use this method of finding volume. The cubes have 2 cm sides. The volume of each cube is 8 cm^3. If measuring with a metric ruler, your density may be different. More accurate measurements may be made with calipers or a micrometer.
2. **Displacement:** The volume of regular or irregular objects can be found by this method. Add water to a graduated cylinder and record the volume. Place the object in the water and record the new volume. The difference in volume is the volume of the object.

Density has units of mass/volume, such as g/cm^3 or g/mL. Normally, the density of solid objects is measured in g/cm^3. Note: $1mL = 1cm^3$.

Students often confuse density with mass and volume. This equal-volume set can help clarify the differences. Mass is the amount of matter in an object. Heavier objects have more mass. The lead block has more mass, more "stuff", than the aluminum block.

Volume is the amount of space an object occupies. The blocks are all the same size. Their volumes are equal.

Since the lead block has more mass in the same volume, it is more dense. The density of lead is higher than the density of aluminum.

Results

You can expect some variation from one set to the next. The metal samples used to make the cubes may have small amounts of other elements, and that can affect their densities. This is particularly true of Iron, which can be any of several different types of cast iron.

Typical density values are listed here, along with the standard deviation from a sampling of 16 sets. Standard deviation describes the amount of variation among the different samples. Larger standard deviations indicate more variation. Your deviation may differ.

	Perfect Density (g/cm^3)	Standard Deviation (can be higher based on non-precise cube measurement)
Aluminum (Al)	2.8	0.058
Zinc (Zn)	7.0	0.144
Iron (Fe)	7.9	0.256
Brass (Br)	8.3	0.133
Copper (Cu)	9.1	0.234
Lead (Pb)	11.6	0.366

Related Products

Density Identification Set (P1-1110) Students identify each of 12 different samples by determining their density. Each cylinder varies in size (volume) and density, but has the same diameter of 1/2”.

Aluminum Density Determination Set (P1-1100) Set includes 12 samples of aluminum. Students learn that the density of a substance is constant even as its mass and volume change.

Density Rod Set (P1-1020) Use this discrepant event to test students' understanding of density, buoyancy, and thermal expansion! The aluminum rod floats in cool water and sinks in warm. The PVC rod does the reverse and sinks in cool and floats...