611-2120 (30-115) Density of Solids

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. Intended for children 13 years of age and up. This item is not a toy. It may contain lead or small parts that can be choking hazards. Adult supervision is required.

How to Teach with Density of Solids Kit:

Concepts Taught: Density; mass; volume; simple metric measurements.

Curriculum Fit: ESCP Program, Chapter P2.

Additional Materials Needed:
- Triple beam balance
- Piece of Clay

Theory:

What is density? It can be defined as: *the mass per unit volume.*
What is volume? It can be defined as: *how much space a solid object occupies in a three-dimensional sense.*
What is mass? It can be defined as: *the amount of matter in a particular object.*

Experiment 1: Determination of Density
Kit Components Needed: Aluminum slab, Aluminum cube, Steel Ball, Glass Ball
Additional Items Needed: Triple beam balance

Procedure:

1. Have the student use the balance to determine the mass (grams) of each object and record it in the data table shown below.
2. Have the student use the ruler to take measurements of each object and then determine its volume (cm^3). Record the data in the table below. *Note: To simplify making the volume measurement of the balls, a graduated cylinder may be used to measure the displacement. A caliper maybe used to measure the diameter.*

   Volume of a Rectangle (Slab) = $l \times w \times h$

   l = length
   w = width
   h = height

   Volume of Sphere (Ball) = $\frac{4 \cdot \pi \cdot r^3}{3}$

   r = radius

3. Determine the density of each object according to the formula shown below. Record values in table below.

   Density = $\frac{mass(g)}{volume(cm^3)}$

Item	Mass (g)	Volume (cm^3)	Density (g/cm^3)
Aluminum Slab			
Aluminum Ball			
Steel Ball			
Glass Ball			

Experiment 2: Determination of Density of Clay Shapes
Kit Components Needed: Piece of clay
Additional Items Needed: Triple beam balance

Procedure:

1. Have the student mold the clay into the following shape: sphere.
2. Use the balance to determine the mass (grams) of the sphere.
3. Have the student use the ruler to measure the diameter of the sphere. *Note: Note: To simplify making the volume measurement of the balls, a graduated cylinder may be used to measure the displacement. A caliper maybe used to measure the diameter. Be careful not to crush the clay sphere.* Calculate the volume of the clay sphere. Record the data in the table below.
4. Next, use the same piece of clay and mold the sphere into a rectangular clay piece.
5. Use the balance to determine the mass (grams) of the rectangular piece. Determine the volume of the rectangle by measuring its length, width and height. Calculate the volume and record the value in the table below.
6. Determine the densities of the clay sphere and the clay rectangle and record the values in the table below.

Item	Mass (g)	Volume (cm^3)	Density (g/cm^3)
Clay Sphere			
Clay Rectangle			

Discussion:

1. How does the density of the clay sphere differ from that of the rectangular sphere? Is the density the same or does it differ? If it differs, discuss some reasons why.

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May we suggest:

Science First® *manufactures many low-cost items that can be ordered from most science education distributors. For more information, please contact us.*

Expand upon the concepts taught in 30-115 Density of Solids Kit by purchasing our **30-092 Density Identification Kit**, which includes twelve different specimens (aluminum, brass, copper, acrylic, pyrex, rubber, nylon, PVC, PTFE, Tecaform, poplar, and oak). Students can use the formula for calculating volume of a cylinder and determine how density varies based on the type of material.

Our **611-2025 Density Cubes Set** is a handy, low-cost set of ten one-inch cubes that can be used in many experiments. What makes it unusual? It offers an array of the materials we actually use today. Learn about the densities of real world building materials: oak, nylon, pine, poplar, PVC, aluminum, steel, brass, copper, and acrylic. Students can use the formula for volume of a cube to calculate the density of each material.

611-2100 Density Rod: What floats in cold water, sinks in hot? Our precisely calibrated cylinder - that's what! It demonstrates the differing density of a liquid at different temperatures. Illustrated instructions. Consists of a durable hollow aluminum cylinder (6.5 cm long and 1.9 cm in diameter) that fits most graduated cylinders. Instructions with experiments. Good for middle school. Wt: 3 oz.

611-2105 Reverse Density Rod: Everyone knows water gets less dense as it gets warmer. Then why does this rod sink in cold yet float in less dense hot water? The answer lies in the fact that the density of the rod also changes with temperature. The rod becomes much less dense at higher temperatures. It wins the “race” against the heated water and floats, whereas the aluminum rod sinks. Contains: High-density polyethylene plastic rod, 1/2” in diameter, weighted and tested; instructions with theory.

611-2155 Density Ball: Our density ball is used demonstrate the effects of temperature and mineral content on density. The metal ball will float in cold water, and sink in hot!
The density of water is not constant but depends upon several factors. The effects of salinity and temperature play a large role in the flow of earth's ocean currents. The 30-166 Denstity Ball can be used by varying salt content as well as temperature, to show the effects on density