Name_____Period _____Date_____

2:8 Sometimes Matter Can Be So Dense!

Background Information:

Matter has many characteristic properties that help to distinguish among matter. One characteristic property of matter is density. Density refers to how tightly packed together the parts of an object are. The more tightly packed the particles of an object are, the denser the object. In this investigation, you will determine the density of different objects in order to distinguish one substance from another.

THINK ABOUT IT 

Density is calculated as the mass of an object divided by its volume. Mathematically written:

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

1. What two properties must you know about a substance in order to calculate its density?

_____

_____

2. If an object has a volume of 10 ml and a mass of 12 g, what would its density be? Show your work.

TIME TO EXPLORE 

Materials:

Triple beam balance	3 unknown objects
Graduated cylinder, 100 ml	metric ruler
Beaker, 100 ml	water

Name_____Period _____Date_____

2:8 Sometimes Matter Can Be So Dense!

Procedure

Part A: Determining Mass

> **Mass** is the amount of matter an object has. We use a triple beam balance to measure mass. If you place an object on one side of the balance, you then add masses to the other side of the balance until the beam balances at zero.

A. Set up the triple beam balance.
B. Calibrate your beam balance. Make sure it reads zero grams when the pan is empty. Adjust the balance if needed by carefully turning the adjustment knob under the pan.
C. Place unknown object A in the center of the beam balance pan.
D. Find the mass of unknown object A to the nearest tenth of a gram.
E. Record the mass in the correct column of chart 1, "Finding Density."
F. Repeat procedures A – E for unknown objects B and C.

Part B: Determining Volume

> **Volume** is the amount of space an object takes up. How you determine an object's volume will depend of the object's shape. There are two types of shapes, regular and irregular. Regular shaped objects are cube or rectangular solids. Irregular shaped objects do not have a cube or rectangular shape.

Finding the Volume of Regular Shaped Objects:

A. Measure the length, width and the height of your regularly shaped unknown object. Round your measurements to the nearest hundredth of a centimeter.
B. Record your measurements in the chart below.

Length (cm)	Width (cm)	Height (cm)	Volume (cm^3)

C. Calculate the volume of your regular solid by using the formula:
Volume = length x width x height

D. Record the volume of unknown object in chart 1.

Name_____Period _____Date_____

2:8 Sometimes Matter Can Be So Dense!

Finding the Volume of Irregular Shaped Objects (Displacement Method):

A. Place 30 ml of water in the graduated cylinder.
B. Measure and record the volume of the water on the chart below.
C. Place the irregularly shaped object B in the graduated cylinder by tilting the cylinder to the side and **slowly** lowering the object to the bottom of the cylinder.
D. Measure and record the volume of water and object on the chart below.
E. Calculate the volume of object by subtracting the volume of the water and the object from the original volume of the water.
F. Record the volume of object in chart 1.
G. Repeat procedures A – F for the second irregularly shaped object C.

Original Volume of Water (ml)	Volume of Water and Object (ml)	Calculated Volume of Object (ml)

Part C: Finding Density

A. Use the formula for density to calculate the density of the unknown objects.
B. Record the densities of each object in chart 1.
C. Compare the densities you found for each object to the list of known densities in the density chart below.
D. Record the identity of each object in chart 1.

Density Chart of Known Metals

Metal	Density
Aluminum	2.7g/ml
Nickel	8.9 g/ml
Lead	11.3 g/ml
Silver	10.5 g/ml

Chart 1
Finding Density

Object	Mass	Volume	Density	Identity
A				
B				
C				