

Determining Buoyant Force

In this lab, you will analyze recorded data to determine the buoyant forces acting on objects.

Problem How does the buoyant force determine whether an object sinks?

Materials

- string
- rock
- spring scale
- can
- plastic tub
- sponge
- paper towels
- 100-g standard mass
- wooden block tied to a fishing weight
- 250-mL graduated cylinder

Skills Measuring, Calculating

Procedure  

1. Tie one end of the string around the rock. Tie the other end to the spring scale. Suspend the rock from the spring scale and measure and record its weight in air in the data table.

DATA TABLE

Object	Weight in Air (N)	Apparent Weight in Water (N)	Buoyant Force (weight in air – apparent weight in water, N)	Volume of Displaced Water (mL)	Weight of Displaced Water (N)
Rock					
100-g standard mass					
Wood block with fishing weight					

2. Place the can in an upright position in the plastic tub. Completely fill the can with water. Wipe up any water that has spilled into the tub. **CAUTION:** *Wipe up any water that spills on the floor to avoid slips and falls.*
3. Lower the rock into the water until it is completely submerged. Record in the data table the apparent weight in water of the submerged rock. Remove the rock from the can.
4. Without spilling any water, carefully remove the can from the tub. Pour the water from the tub into the graduated cylinder. Record in the data table the volume of displaced water .
5. Repeat Steps 1 through 4, first with the 100-g standard mass and then with the wooden block that is tied to a fishing weight.
6. To determine the buoyant force on each object, subtract its apparent weight in water from its weight in air. In the data table, record these values.

7. Calculate the weight of the water that each object displaces. (*Hint:* 1.0 mL of water has a weight of 0.0098 N.) In the data table, record these weights.

Analyze and Conclude

1. **Observing** What force is responsible for the difference between the weight of each object in the air and its apparent weight in water?

2. **Analyzing Data** How is the buoyant force related to the weight of water displaced?

3. **Forming Operational Definitions** Define buoyant force and describe two ways you can measure it or calculate it.

4. **Drawing Conclusions** Explain what causes an object to sink or to float, using the terms *buoyancy*, *weight*, *force*, *density*, and *gravity*.
