



# Buoyancy In A Bottle

## Question

How can bottles be used to model buoyancy?

## Hypothesis

Write a statement describing how you think water bottles and sand can be used to model buoyancy as it relates to a floating wind turbine.

## Materials

- 1 Empty water or soda bottle
- Clean play sand
- Tub of water
- Water (extra if needed)
- Balance
- Paper towels / towels
- Marker

## Procedure

1. Check the depth of water in your tub. Add water if necessary until the water is within 7-10 cm from the top. The water needs to be deeper than the bottles are tall.
2. Record the volume, in  $\text{cm}^3$ , of the bottles you are using. Remove the labels from the bottles.  
Conversion:  $1 \text{ mL} = 1 \text{ cm}^3$
3. Measure the mass of the empty bottle. Record it in the data table.
4. Use a permanent marker to mark the half-way point from top to bottom of the bottle.
5. Put the cap on the bottle tightly and place it in the water in the tub. Record your observations. Does it float upright? What happens when you try to stand it up? Can it stand "on its head?" What happens when you try to force it to float upside-down?
6. Fill the bottle with sand. Replace the cap and measure its mass.
7. Put the bottle full of sand in the tub of water. Record your observations. Does it float? Does it sink? How quickly does it sink?
8. Dump the sand out of the bottle.
9. Based on your observations from steps 5 and 7 above, estimate the amount of sand you need to add to get it to float halfway in the water while remaining upright. Add that amount of sand to the bottle. Replace the cap and test your estimation.
10. Repeat step 9 until you have found the amount of sand needed in the bottle to allow the bottle to float upright, halfway in and halfway out of the water. Record this mass in the data table.
11. Save this bottle for the *Anchoring a Floating Wind Turbine* activity.

## Data and Observations

Bottle/sand combination	Volume of bottle ( $\text{cm}^3$ )	Mass of bottle and sand (g)	Density of bottle contents ( $\text{g}/\text{cm}^3$ )
Empty			
Full of sand			
Bottle floats half in, half out of water			

Record observations of the empty and full bottles here. Include diagrams, if helpful.

