

Buoyancy

Today we are going to learn about a different force called **buoyancy**. Buoyancy is the force that makes things float. It keeps boats, icebergs, and fish, among other things, from sinking.

The buoyancy of an object is related to its **density**. The density of an object is defined as $\frac{m}{V}$, its mass divided by its volume. Because of this, something that is small but heavy for its size (a coin for example) has a high density. Something that is light for its size (a box full of Styrofoam peanuts, for example) has low density. Things that have high density sink, while things with low density float. Would the coin sink or float? How about the box?

So how does a big, heavy boat float on the ocean? Obviously the metal that the boat is made out of is denser than the water. A boat floats because it is hollow: it is held up by the buoyant force. The buoyant force happens because water is pushed out of the way, or displaced. The more water is displaced, the stronger the buoyant force. Imagine pushing a beach ball under water at the swimming pool. As more of the ball is pushed under water, it gets harder to keep pushing it down. That is because more water gets pushed out of the way as the ball is submerged, and the buoyant force is increased.

The greater the *volume* of water pushed out of the way, the greater the *buoyant force*. This is the same reason a boat floats.

Now think about a boat. If you put something heavy on it, does it rise or sink? Is more or less water displaced? If more water is displaced, is the buoyant force stronger or weaker? Does this make sense (remember that the boat is heavier now)? Talk about this with your mentor.



Name: _____

Date: _____

Per: _____

Buoyancy Questions

1. Why does a rock sink but a piece of wood floats?
2. Why does aluminum foil sink when it is crushed, but floats if it is shaped like a boat?
3. Why did your boat sink when you added too many pennies?
4. Whose boat worked best? Why was it the best?

Bonus Question: The USS Nimitz Aircraft Carrier displaces more than 3 million cubic feet of water when sunk. How much can the USS Nimitz weigh before she sinks? How many small cars could she hold?



(There are approximately 60 pounds per cubic foot of water, and 2000 pounds in a ton. The average small car weighs about 1 ton.)