

## Why Do Some Objects Sink While Others Float?

In order to answer this question, it is important to understand the concept of buoyancy. This term refers to the pressure a liquid exerts on an object relative to its weight.

Ancient Greek scientist Archimedes came up with this concept, and noted that the force applied to an object by a liquid is proportional to the weight of the water displaced by the object. An object's buoyancy is affected by its mass and its surface area.



A cargo ship distributes its weight over a greater surface area.

## How Is buoyancy Affected by Mass?

Size is not always a good predictor of whether or not an object will float or sink. For example, a marble and a grape are about the same size, but the marble would be more likely to sink. This is because the marble has a greater density. Density is defined as mass per unit of volume. The denser an object is, the less buoyant, or capable of floating, it will be. This rule applies to both living and non-living things.

## Different Duck Species Have Different Masses, Which Affects Their Buoyancy

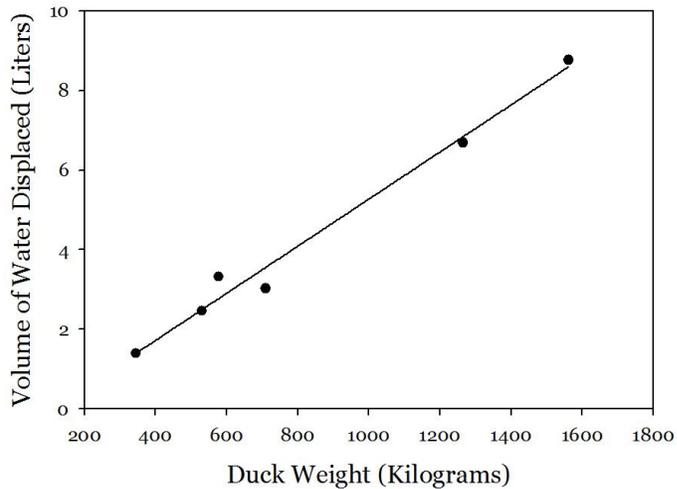
Scientists weighed ducks from several different species. They also noted that the ducks that weighed the most were bigger, so the density of the ducks was fairly constant. Next, they placed the different ducks in a cylinder of water and measured the amount of water that they displaced.

They found that the ducks that weighed the most displaced the most water.



Ducks are buoyant; they float easily on the surface of the water.

Relationship between duck weight and Buoyancy



## Many Animals Have the Ability to Adjust Their Density to Regulate Their Buoyancy

New research has shown that small ocean-dwelling animals called plankton regulate their buoyancy by changing their fat content. Since fat in different forms can have different densities, the buoyancy of the small organisms can change as their fat content changes.

Whales also regulate their buoyancy by changing their fat content. Whales can accumulate fat, or blubber, at certain times of the year to help them maintain a certain level of buoyancy to help them swim. So this clever strategy has been adopted by the largest and smallest ocean animals.



Small ocean plankton regulate their buoyancy the same way that whales do.

## How Is Buoyancy Affected by Surface Area?

By distributing weight over a larger surface area, buoyancy can be increased. That is why heavy shipping containers can be transported on cargo ships. These containers would sink if dropped directly into the ocean. The density of the containers is much greater than the density of the ocean. But, when the weight of the containers is distributed over the area of the ship, they can float.

Swimmers also demonstrate the relationship between buoyancy, mass, and surface area.

Lying backward in the water allows a swimmer to successfully float because his or her body is at or near the surface of the water. However, if the swimmer leaves the backward float position and points his or her legs down towards the bottom of the water, chances are he or she won't be able to float any longer. This is why scuba divers are skilled swimmers who must be aware of the concept of buoyancy in order to safely swim to the bottom of a body of water.



A swimmer must know the principles of buoyancy, mass, and surface area to stay afloat or dive.