

# Oceans: Exploring Density

## BACKGROUND

As you learned in the “Oceans” episode of Brainchild, the seven layers of the ocean form due to differences in density. **Density** is a physical property of matter. It is found by measuring the mass and the volume of a substance and finding the ratio of the two (dividing mass by volume). The density of a substance does not change depending on how much of the substance you have. In other words, the density of a drop of water and the density of an entire swimming pool of that water is the same! It is important to know that density is constant for a substance, no matter how much of that substance you have, AS LONG AS TEMPERATURE DOESN'T CHANGE.

To understand this, we have to zoom in and look at what substances are made of, atoms and molecules. With few exceptions, when atoms or molecules in a substance are colder, they come close together. The opposite happens when they are warmer. When a group of molecules are close together, they take up less space, or have less volume, than if you warm them up. So if we take a substance and heat it up, (we have not added or taken substance away so the mass hasn't changed) its volume will increase due to the molecules spreading apart, and its density will decrease. Different temperatures of water in the ocean will have different densities and will form different layers. Remember, substances that are more dense will sink below substances that are less dense.

**Salinity**, or the amount of salt dissolved in water, plays just as important a role as temperature in helping form our ocean layers as well as deep ocean currents. Not just temperature but the amount of salt dissolved in water also will affect the density of the water. While dissolving salt in water doesn't seem to change the volume much, it certainly changes the mass. Because you are adding salt to water, you will end up with a larger mass but no noticeable change in volume, what do you think this will do to density? Let's find out!

## PREDICT

Is salt water or plain water more dense? Why do you think that?

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## PROCEDURE

1. Fill the plastic cup about halfway with water. Drop a grape in the water and record your observations in the table. Comment on the relative densities of the water and the grape.
2. Stir in salt to dissolve until you notice a change in the grape, record your observations and comment on the relative densities of the water and grape.

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Substance	Observations	Which is more dense?
Water		Water Grape
Salt water		Salt water Grape

### DEMO ANALYSIS

Based on the reading above and your teacher's description of the setup in front of you, predict what will happen when the barrier between cups is removed.

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### ANALYSIS

What trend in temperature and salinity would you expect to find as we go deeper down through the 7 layers of the ocean based on your experience? Explain.

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