# Seawater Density Lab

Earth Science

## Introduction

Seawater covers more than 70% of Earth’s surface. This means that the majority of the water on Earth is salty. However, salinity varies with different types of seawater. The density of seawater also varies as a result of ocean depth and temperature.

The density of pure water is 1 g/mL. Objects with densities greater than 1 g/mL will sink in water, while objects with densities less than 1 g/mL will float in water. In this activity, you will compare the density of freshwater with the densities of various saltwaters by observing whether an egg will float or sink in each type of water. By observing the behavior of the egg, you will be able to predict how density changes as a result of changes in salinity.

Density is the mass of a substance per unit of volume, and it can be calculated using the following formula:



## Materials

* Disposable cups, clear plastic, not Styrofoam (4)
* Egg, raw (1)
* Measuring cup
* Measuring spoons
* Permanent marker
* Soup spoon
* Table salt

## Helpful Conversions

* 1.0 teaspoon (tsp) of table salt has a mass of approximately 5.7 grams (g).
* 1.0 cup of pure water at 4.0o C has a volume of approximately 237 mL and a mass of approximately 237 g.

Note: In this experiment, volumes are given in terms of teaspoons and cups for the convenient use of household measuring tools. However, when completing the data table and writing the lab report, metric units must be used. Use the Helpful Conversions above to convert units.

## Procedure

1. Take an egg out of the refrigerator and let it warm to room temperature (about 3 hours).
2. Use the permanent marker to label four of the plastic cups in the following way:
   1. fresh (no salt)
   2. 2 tsp salt
   3. 3 tsp salt
   4. 4 tsp salt
3. Pour one cup of water into each of the four labeled cups.
4. Add salt to the cups according to their labels. Stir to dissolve the salt.
5. Beginning with cup 1, test whether the egg floats or sinks in each cup. Use the soup spoon to transfer the egg into and out of the water. Repeat for each cup. Before transferring the egg to a new cup, rinse it and pat dry.
6. Record observations in the data table.
7. **Observing and Predicting** Based on your observations of the behavior of the egg in each cup, rank the densities of the water samples from least to greatest.
8. **Calculating** Calculate the mass of each sample and record it in the data table. Use the Helpful Conversions chart to help you. For convenience, the volume of water for each sample has been calculated for you.

**Tip:** The volume of the solution is provided for you. The volume of the solution will increase marginally during lab trials. By rounding to the nearest whole milliliter (mL) the volume is constant.

1. Using the formula for density, calculate the density of each water sample to three decimal places and record it in the data table. Were you correct in your predictions of the different densities of the water samples?

## Data Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sample** | **Egg Floats or Sinks?** | **Mass of**  **Sample (g)** | **Volume of**  **Sample (mL)** | **Density (g/mL)** |
| **Cup 1**  **Freshwater** | Sinks | 237 | 237 | 1 |
| **Cup 2**  **Water with 2 teaspoons of salt** | Sinks | 242.7 | 237 | 1.0240506… |
| **Cup 3**  **Water with 3 teaspoons of salt** | Floats 2mm above surface | 248.4 | 237 | 1.0481012… |
| **Cup 4**  **Water with 4 teaspoons of salt** | Floats 4mm above surface | 254.1 | 237 | 1.0721518… |

1. **Observing and Predicting** Based on your density calculations and the behavior of the egg in each cup, predict the density of the egg in g/mL.

The density of the egg is between 1.024 and 1.048.