Ocean Water Density Lab

Introduction

Density depends on mass and volume. Salt has a different density than water, so salt in the ocean affects seawater's density. In this activity, you will determine if salt water is denser or lighter than fresh water.

Procedures

1) Look at the three objects and PREDICT whether you think each one will sink or float in the fresh water and in the salty water. Circle "SINKS" or "FLOATS" in the left columns of the table.
2) Fill two containers each with 400 mL of water.
3) Stir 3 spoonfuls of salt into one of the containers.
4) Test your predictions by placing the objects in each container and record "SINKS" or "FLOATS" in the right columns of the table.

Data Table

	Prediction		Observations	
Object	Fresh Water	Salty Water	Fresh Water	Salty Water
	SINKS FLOATS	SINKS FLOATS		
	SINKS FLOATS	SINKS FLOATS		
	SINKS FLOATS	SINKS FLOATS		
	SINKS FLOATS	SINKS FLOATS		

Questions

Do any of the objects behave differently in fresh water and salt water (sink in one and float in the other)? Which ones?

If an object floats in salt water and sinks in fresh water, which liquid is denser? Explain.

What conclusions can you make about salinity and density?

Water Density Lab II

The density of seawater varies from place to place in the ocean, depending on evaporation and rainfall rates, river runoff, and water temperature. The density of the water in which marine organisms live influences several aspects of their lives, such as the flotation of planktonic forms. In addition, sinking masses of higher-density seawater carry oxygen-rich waters from the surface to greater depths, as less-dense nutrient-rich water moves upward. Finally, sinking of highdensity cold seawater in the north Atlantic drives the global circulation of water throughout the world's ocean basins. Today's lab exercise will demonstrate the relationships between water density, temperature, and salinity.

Experiment 1. Density comparisons

1. Fill a plastic tank ¼ full with room temperature water and place one end of the tank on a textbook. Collect a small beaker (40ml) of red salty water, and fill another beaker with 40 ml of blue freshwater (you may have to dye the water yourself).
2. At the higher end of the tank slowly pour one of the beakers into the tank and observe what happens.

Record observations here. Draw your tank of water and add color and labels.

What do you think happened?

3. Add the next beaker of water.

Record observations here. Draw your tank of water and add color and labels.

What do you think happened?

4. Next, switch things up a bit. Play with Salinity. Predict what you think may happen when you add super concentrated saltwater and add a temperature variable. Don't forget to label your variables and colors so you do not get mixed up when adding them. Write down what your procedures will be and what your variables are below. Create a table with your variables and draw the results (with colors and labels).
5. Explain what you think has happened, and relate it to what we see in the world's oceans.

5. How do oceanographers measure the different densities out in the open ocean?

6. Why is this information important?

7. Who would this information be important to?

8. Table 1 lists the approximate surface water salinities at various latitudes in the Atlantic and Pacific Oceans. Using the data construct a salinity curve for each ocean. Use different colored pencils for each ocean!

Table # 1 All measurements are in parts per million.

Latitude	Atlantic Ocean	Pacific Ocean
60oN	33.0	31.0
50o	33.7	32.5
40o	34.8	33.2
30o	36.7	34.2
20o	36.8	34.2
10o	36.0	34.4
Oo (Equator)	35.0	34.3
10oS	35.9	35.2
20o	36.7	35.6
30o	36.2	35.7
40o	35.3	35.0
50o	34.3	34.4
60o	33.9	34.0

9. At which latitudes are the highest surface salinities found? Suggest a reason why.

10. Of the 2 oceans, which has the higher average surface salinity? _____

Lab Part III
Ocean Convection:

Materials:
Plastic tank
6 styrofoam cups
Food coloring
Hot water
2 Pipettes

1. Fill a plastic tank with room temperature water and place it on four of the Styrofoam cups.
2. Collect a beaker of 20 ml water add red food dye.
3. With a pipette add 4 drops of red dye water to the bottom left side of the tank and the same to the right side. Do not jostle the water.
4. Collect 2 cups of Hot water from the water bath and place them under the tank where you placed your red dye. Watch what happens and record below.

5. Setup a new tank follow steps 1-2. Add red food dye to just the left side of the tank. Obtain a blue ice cube and place it on the surface on the Right side of the tank. Record your findings below.

6. Create your own convection lab. Describe the procedures and hypothesis of what might happen. Follow through with your experiment recording all reactions and variables.

Lab Part IV

Buoyancy

Procedure:

1. Get into groups of 2-3. As a team, you will design a boat that holds the most pennies.
2. Each group gets 40 pennies and a tub of water.
3. Each student gets a 15cm by 15cm square of aluminum foil.
4. Use your foil to construct a boat that you think will hold the most pennies without sinking. [5 minutes] Each boat can ONLY be made from ONE sheet of foil.
5. Begin testing the number of pennies that each boat can hold by putting in one penny at a time.
6. The boat must remain floating for 5 seconds before it is considered a successfully added penny. After 5 seconds, you may then add another penny.
7. If water enters the boat, or your boat touches the bottom of the container, your boat is "sunk." The last penny added (that sunk the boat) will not count in the total amount held.
8. As a group, discuss the pros and cons of each of your boat designs. Look at the boat that held the most pennies before sinking, and discuss what made that boat better than the other boats. (Also, consider the flaws you want to avoid in your new boat design.)
9. Use the space below to make sketches of the best design.
10. Now, make a new boat using the design elements that worked the best for your group to enter into the all-group competition. Design your winning boat here:

What makes a boat float? (don't just say buoyancy)

Lab Part V Salinity Experiment

As you now know, the ocean contains many dissolved salts. How do you think this may affect the objects within the ocean? Have you seen some objects float, while others sink to the bottom? This is directly related to density, which is a measurement of the mass per volume of an object. Density determines whether an object will float or sink. But how are salinity and density related?

In this activity, you will investigate the effects of salinity on density by observing whether an object sinks or floats in water of varying salinity.

First, determine the problem: How does salinity affect whether a potato slice will float or sink?

Next, develop a hypothesis: Based on what you know about density, do you know enough to formulate a hypothesis? A hypothesis is an educated guess, so you must gather information on salinity, why things float or sink, and the specific density of a potato. Include this information in the introduction portion of your lab report.

Now, design an experiment: Develop a controlled experiment that will identify how increasing salinity influences the ability of a potato to float in water. You might want to use the following materials:

small uncooked potato teaspoon salt large glass bowl

water measuring cup measuring spoons metric ruler

List the steps that you need to take to test your hypothesis. Be specific and describe exactly what you will do for each of your steps. How will you determine the density of the potato and the different water samples? Be sure to be specific enough so that someone else can duplicate your exact experiment.

Record your results in an appropriate data table and construct a corresponding graph. Include digital pictures or drawings with your qualitative and quantitative observations. When constructing your graph based on your data, remember, a line graph is used to demonstrate change over time, and a bar graph is used to illustrate comparisons.

Determine the analysis and conclusions Discuss the execution of your lab, your findings, and their validity. Include a statement of response to your hypothesis.