



Objectives

- ▶ introduce basic oceanographic concepts—size, depth, tides, salinity
- ▶ observe how salinity affects buoyancy
- ▶ work cooperatively to make scientific observations, predictions and conclusions

Vocabulary

tides

salinity

buoyancy

oceanography

Background

Oceans cover approximately 75 percent of the earth's surface. These enormous bodies of water are constantly moving with waves, currents and the effects of tides. In most parts of the world, the water level along the coast rises and falls twice a day due to tides. Tides are caused by the gravitational forces of the moon and the sun. The moon has the greatest effect since it is closest to the earth. High tides occur on the sides of the earth closest to and opposite the moon. Low tides occur on those parts of the earth at right angles to the moon.

The study of the ocean is called oceanography. Scientists who study the ocean are called oceanographers. Oceanographers learn about the ocean by measuring ocean characteristics like water

depth, wave height, current speeds, temperature and salinity. All ocean water is salty, but the amount of salt in the water, its salinity, varies from place to place around the world. At the mouth of a river, for example, salinity may be low, since ocean water is mixing with freshwater. In a hot dry area, like the Red Sea, salinity may be high due to evaporation.

Scientists measure salinity in parts salt per thousand parts water. The average salinity of the world's oceans is 35 parts per thousand. Differences in salinity can affect ocean plants and animals. Salinity is one of many measurements SFS students learn to make while studying life in the waters that surround South Caicos.

Materials

for each team:

three 10 or 12 ounce plastic cups
table salt
measuring cup
tablespoon for measuring

teaspoon for stirring
one egg
Salinity Experiment Worksheet

Activity

Part I:

Begin your discussion of the oceans with a Trivia Quiz. See if students can answer these questions.

1. How much of the earth is covered by oceans? *Answer:* Three quarters.
2. Which is the world's largest ocean? *Answer:* The Pacific Ocean. It is equal in size to the Atlantic, Indian and Arctic Oceans combined.
3. What is the deepest place in the oceans? *Answer:* The 35,800-foot deep Mariana Trench in the western Pacific. The tallest mountain on land, Mount Everest at 29, 028 feet could be sunk in this trench and still be thousands of feet beneath the ocean's surface.
4. What is the difference in height between high tide and low tide in the Bay of Fundy in Maine? *Answer:* 40 feet. That's as tall as the average 4-story building.
5. What is the name of the undersea river off the southeastern coast of the United States? *Answer:* The Gulf Stream. This ocean current flows at speeds of up to 5 mph. It is about 50 miles wide and 1,500 feet deep.
6. Who is credited with inventing modern scuba diving? *Answer:* Jacques Cousteau was the first to use Self Contained Underwater Breathing Apparatus (SCUBA) for undersea exploration in 1950.
7. What is a tsunami? *Answer:* Giant ocean waves, also called tidal waves, caused by earthquakes and volcanic eruptions beneath the sea. They can travel at 450 miles per hour and may reach heights of more than 100 feet by the time they reach land. Most ocean waves are caused by wind.
8. Which freezes first, fresh water or salt water? *Answer:* Fresh water. The temperature of the Arctic Ocean is 31°F.
9. Which is heavier, fresh water or salt water? *Answer:* Salt water. In places where rivers flow into the sea, the fresh river water floats on top of the salty ocean water.
10. What is the name of the undersea mountain range between North America and Europe? *Answer:* The mid-Atlantic Ridge.

Part II:

Divide students into teams and have them conduct the salinity and buoyancy experiment using the Salinity Experiment Worksheet. When all teams have finished, discuss the results.

Extend the Activity

Have students investigate the effects of shape on buoyancy. Give each student team several pieces of modeling clay. Ask them to form a ball with the clay and place it in a cup of fresh water. Discuss: Does the ball of clay float? What happens if the shape is changed? Can they find a shape that floats?

Have students research the tidal cycle and draw diagrams showing how the tides change based on the position of the moon and sun.

Have students learn to record and analyze other kinds of data. Place an outdoor thermometer in a location visible from the classroom. Ask students to keep a daily record of air temperature. At the end of each week assign a team to graph the results. Continue to collect this data throughout the year. Discuss how the temperature changes from week to week and month to month. What effect do these changes in temperature have on the wildlife in your area? What effects to changes in temperature have on ocean animals (for example, corals need warm waters; penguins live in cold waters)?

Salinity Experiment Worksheet

Name: _____

Purpose of the Experiment: Observe the effect of salinity on buoyancy.

Procedure:

- Step 1:** Label cups 1, 2 and 3. Measure 1 and 1/4 cups of fresh water into each of the three cups.
- Step 2:** Place an egg in Cup 1. Do you think the egg will float or sink? Observe what happens. Record your observations below.
- Step 3:** Put one tablespoon of table salt in Cup 2. Stir to dissolve. When the salt disappears, gently remove the egg from Cup 1 and place it in Cup 2. Do you think the egg will float or sink? Observe what happens. Record your observations below.
- Step 4:** Put two tablespoons of table salt in Cup 3. Stir to dissolve. When the salt disappears, gently remove the egg from Cup 2 and place it in Cup 3. Do you think the egg will float or sink? Observe what happens. Record your observations below.

Results:

Cup 1	Cup 2	Cup 3
Fresh water	+1 TBS. Salt	+2 TBS. Salt
I observed _____	I observed _____	I observed _____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Conclusions: What have you learned about salinity and buoyancy from this experiment?