



**Gundalow
COMPANY**

Protecting the Piscataqua region's
maritime heritage and environment
through education and action

603.433.9505 | www.gundalow.org | 60 Marcy Street, Portsmouth, NH 03801

States of Matter/ Comparing Densities of Water

This activity is great for 6-10-year olds and can be done over 2-3 days.

Objectives:

Students will be able to:

- 1) create a lab sheet to record data.
- 2) explain an example of three states of matter
- 3) measure the density of different solids
- 4) measure the density of saltwater vs fresh water
- 5) measure the density of cold vs hot water
- 6) make connection to the estuary (water)

Vocabulary: mass, matter, density, gravity, variable, estuary

Materials:

- cups or beakers
- self-made lab sheet or large tablet
- white board/dry erase markers
- access to water, salt, food coloring
- aquarium or large clear bowl
- different fruits (banana, orange, apple, etc)
- three or four different soda cans unopened (Moxie, diet Pepsi, coke, Dr Pepper)

Activity Guide:

Day 1 - States of Matter

- 1) Review the concept of matter - Anything that has mass and takes up space.
- 2) Ask: What is the difference between weight and mass? Mass is determined by the amount of molecules in a given space on earth (with gravity) or in space (without gravity=weightless).

Draw on the white board or tablet three circles. Use dots to show the three states of matter solid =tightly packed, liquid=loosely packed, gas=more air than matter.

(Extension: There is also plasmatic matter found in space. What state of matter do you think magma and lava from a volcano would be?).

- 3) Ask: What state of matter is an ice cube? (solid) What do you think will happen if we put the ice cube in a zip lock bag and hang it in a sunny window? Write their hypotheses on the tablet - accept all guesses.
- 4) Prepare the ice cube in the zip-lock bag. Secure the seal tightly. Hang by scotch tape in a sunny window.
- 5) Observe over the next hour and draw diagrams of what happens. Discuss conclusions. (Water changes from a solid to a liquid to a gas if heated).
- 6) Next explain that we are doing what scientist do: Hypothesize, arrange materials observe and collect evidence, record the findings.

Day 2 - Density of Solids

- 1) Ask: Which state of matter has the molecules most tightly packed - densest (solid). Which is the least dense (gas). If put different solids in the water how can we measure which are densest (It will sink). Least dense - it will float.
- 2) Lay out the samples of fruit next to the clear container of water.
- 3) Write your hypotheses on the tablet or draw a picture of what the fruit will look like in the water on the tablet. Confirm or correct your hypotheses. Eat the fruit!
- 4) Put the cans of soda in front of the container of water. Discuss what **variables** will determine the density of each soda (amount and density of the ingredients ex. grams of sugar). Read the list of ingredients on the soda. Draw a diagram of your guesses. Label the cans.
- 5) One at a time put the cans in the water to float at different levels. (**Buoyancy**) Adjust your diagram to show the results from densest to least dense.

Day 3: Density of Saltwater vs Fresh Water

- 1) What is and **estuary**? (Where rivers meet the sea, a tidal mix of fresh and saltwater). Where is an estuary near (your town)? Where does the saltwater come from? (the

ocean) Where does the fresh water come from? (the rivers and uplands) What do we call the water that is mixed fresh and salt (**brackish**)?

- 2) Which do you think is denser fresh or saltwater? Write your hypotheses on the tablet.
- 3) Mix 1/2 cup of salt in a quart of tap water. Label A. Label B a quart of fresh water. **Do not reveal which is which**. Put out two clear glass (or plastic) jars. Fill one with fresh, one with salty water. Use the food coloring to mark one of the samples. Leave the other clear. How can we test for density? (no tasting) Let students experiment by **slowly** dripping one solution into the other. The denser water (salt) will sink. Try again with the other solution colored.
- 4) Draw, discuss, and write conclusions. (Saltwater is denser than fresh water.)
- 5) Connections to estuaries: As the saltwater comes in with the tide it settles to the bottom of the water column and moves up the estuary like a wedge. Organisms (living things) will occupy the salty, fresher, or brackish water that is most likely to contain the food sources and conditions that they require and will move or stay put accordingly. Some organisms can tolerate very salty water (mummichogs), some fresher water, and some (salmon) move and adapt to both salty and fresh habitats.

Day 4- Extension:

Follow the same directions from the salty/fresh investigation but use one sample of cold water and one with warm or hot water. If you heat water the molecules will become agitated and as the liquid becomes less dense the matter changes from a liquid to a gas much like the ice cube changed from solid to liquid to gas