

What Materials Float? What Materials Sink?



Focus: Students use the inquiry process to investigate the buoyancy of different self-chosen solids. Students record their predictions and results on a graph.

Specific Curriculum Outcomes

Students will be expected to:

- 19.0 select and use materials to carry out their own explorations and investigations [GCO 2]
- 21.0 construct and label concrete-object graphs or pictographs [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- list several solids that float in water and several that sink
- create concrete-object graphs and pictographs to represent exploration results

NOTES:

Attitude Outcome Statements

Encourage students to:

- show concern for their safety and that of others in carrying out activities and using materials [GCO 4]

Cross-Curricular Connections

Math

It is expected that students will:

- construct and interpret concrete graphs and pictographs to solve problems [2SP2]

English Language Arts

Students will be expected to:

- speak and listen to explore, extend, clarify, and reflect on their thoughts, ideas, feelings, and experiences [GCO 1]
- use writing and other forms of representation to explore, clarify, and reflect on their thoughts, feelings, experiences, and learnings; and to use their imaginations [GCO 8]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• <i>What Is the Inquiry Process?</i> poster • Science Card 11 • IWB Activity 8	• bottle of oil-and-vinegar dressing from <i>What Happens When We Combine Liquids and Solids?</i> (see pages 31–38) • 3–4 samples each of marbles, cotton balls, sugar cubes, blocks of wood, plastic blocks, Styrofoam trays, sponges, gummy candies, and soda crackers • tubs of water (one per pair + one extra for demonstration) • students' Science Journals • small amounts of various items, such as paper clips, crayons, craft sticks, jelly beans, coins, bars of soap, lumps of clay, rocks, plastic toys, ice cubes, feathers, cans of diet cola, cans of regular cola, pumice stones, peeled oranges, unpeeled oranges, and pieces of string • digital cameras (optional) • large box of salt • stirring tools • toy plastic buckets (one per pair) • ½ dozen raw eggs (if permitted)	• Fill several tubs with water.	• dense • density • concrete-object graph • pictograph

Safety

- Remind students not to taste any of the substances they are investigating.

Science Background

- The weight of an object is the measure of gravitational force acting on that object. The buoyancy of an object placed in liquid is the measure of the upward force of the liquid acting on that object. When the upward force acting on an object in liquid is greater than the downward force of gravity (or its weight), the object floats, and vice versa.
- Objects that are less dense than the liquid they are in will float. Objects that are more dense than the liquid they are in will sink.
- Salt water is more dense than unsalted water. Therefore, an object that sinks in unsalted water (because it is more dense than the water) may float in salt water, if the salt water is more dense than the object.

Possible Misconceptions

- Students may think that if an item is small, it will float, and if an item is large, it will sink. This is because they believe that the size of an object is what determines its buoyancy.
- Students may also think that objects have a greater chance of floating if they are placed in more water. For example, they may believe that a pebble that sinks in a glass of water may float when placed in a pond.

ACTIVATE



Density Review

Display (or ask students to recall) the bottle of oil-and-vinegar dressing from *What Happens When We Combine Liquids and Solids?* (see pages 31–38). Review why the oil and vinegar are separated and why the pepper pods are at the bottom of the bottle. Review the meaning of the words “dense” and “density” on the Word Wall (how tightly the particles in a substance are packed together). Tell students that the density of an object can help us predict whether a solid will float or sink in a liquid.

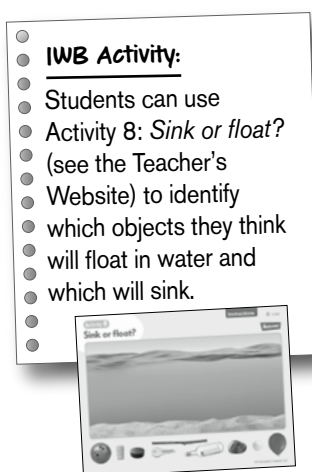
CONNECT



Inquiry Process

Review the steps on the *What Is the Inquiry Process?* poster. Tell students they are going to follow these steps to answer the questions

- What solids float in water?
- What solids sink in water?



Invite students to add their own questions about buoyancy and solids to the I Wonder Wall. Then ask students to formulate a plan for answering these questions. (They will probably suggest testing a variety of solids to see if they float or sink.) Tell them you are going to model how to use the inquiry process, and then they will use it to do their own investigations.

Making Graphs

Display Science Card 11 and discuss with students if they predict these objects will sink or float in water. Model asking questions about the objects on the card, such as:

- **Do sponges float? Do they sink when they get wet?**
- **What about gummy candies? How dense are they?**

Make a large concrete-object graph to show the predictions of which items will float and which will sink. Create a T-chart on a sheet of chart paper, with the headings “Float” and “Sink.” Provide a sample of each item on Science Card 11 (marbles, cotton balls, sugar cubes, blocks of wood, plastic blocks, Styrofoam trays, sponges, gummy candies, and soda crackers) and have students place the samples on either side of the T-chart, according to the class’s predictions.

Then, gather students around a tub of water. Tell them you are now going to explore your questions and record the results. Ask students to help you gently place samples of each item shown on Science Card 11 in the water one at a time and observe what happens. Model drawing each item on a sheet of paper and noting whether it sank or floated.

Invite students to discuss the results of your inquiry and to make conclusions. Then, to share the results of what you have learned, help the class reconfigure the concrete-object graph by moving samples to the correct side according to the inquiry results. Students can copy this final graph (as a pictograph) into their Science Journals.

CONSOLIDATE

Student Inquiry

Tell students it is their turn to use the inquiry process to explore floating and sinking. Display a variety of items, such as paper clips, crayons, craft sticks, jelly beans, coins, bars of soap, lumps of clay, rocks, plastic toys, ice cubes, feathers, cans of diet cola, cans of regular cola, pumice stones, peeled oranges, unpeeled oranges, and pieces of string. Student pairs can spend a few minutes generating one or more questions based on these items, making a plan to answer the question(s), and deciding how they will record their results (e.g., on paper, with a digital camera).

Once you have approved students’ question(s), plan, and recording method, provide each pair with a tub of water and allow them to select the items they want to investigate. As each pair investigates, make sure they are recording their results. Students can then draw a pictograph in their Science Journals to show what they learned.



EXPLORE MORE

Just Add Salt

Students can use smaller containers (such as toy plastic buckets) to investigate how the results of their inquiry change if they use salt water instead of fresh water, and if they then add more salt to the salted water. If there are no allergies among students, provide raw eggs for them to test in both unsalted and salt water, in addition to their original items.