Welcome to Family Science Night!

How does density affect an object's ability to sink or float in water?

How many of you have bobbed for apples?
Who has thrown pennies into a fountain?
Who has pebbles along the bottom of their aquarium?
Have you ever seen an insect or a bug floating on the top of a pond or a body of water?

The density of an object affects its ability to float or sink in water.

Purpose

To make and test predictions about whether objects sink or float.
To classify objects according to whether they sink or float.

Questions to ponder:

- ◊ Can you name materials that float in water?

- ◊ Can you name materials that sink in water?

- ◊ What is density? What is buoyancy?

Investigate with different solids to see if they sink or float in water.

Remember that scientists do not taste any of the supplies.

1. Using the list of materials below, predict if each solid will sink or float when placed in a bucket of water.

2. Observe the properties of each item.

3. Create a hypothesis. Why do some materials float? Why do some materials sink?

4. Gently place in the bucket of water each item listed below one at a time.

5. Record your observations on the data sheet.

6. Place the items that sank in one pile and the items that floated in another pile.

Investigate:

Material	Prediction Sink or Float?	#1 Test Sink or Float?	#2 Test Sink or Float

Hypothesis:

_____

_____

_____

Solids to Test:

- ◊ Can of Coca Cola
- ◊ Can of Diet Coke
- ◊ Can of Caffeine-Free Coca Cola
- ◊ Can of Caffeine-Free Diet Coke
- ◊ Apple
- ◊ Orange
- ◊ Pear
- ◊ Grape
- ◊ Beach ball
- ◊ Feather
- ◊ Penny
- ◊ Paper clip
- ◊ Aluminum foil
- ◊ String
- ◊ Plastic Spoon
- ◊ Paper cup
- ◊ Dice
- ◊ Leaf
- ◊ Rock
- ◊ Clay
- ◊ Wood

Investigate:

Coke Floats?

	Coca-Cola	Diet Coke	Caffeine-Free Coke	Caffeine-Free Diet Coke
Caffeine Yes/No				
Sugar Amount				
Float/Sink				

Which ingredient – sugar or caffeine – seems to have the greatest effect on the density of the cans of soda?

_____

_____

_____

More questions to ponder:

1. How many of your predictions were correct?

2. Look at the pile of objects that sank. Describe them. Do they have anything in common with one another?

3. Look at the pile of objects that floated. Describe them. Do they have anything in common with one another?

4. Does it matter how deep the water is?

5. Does it matter how much water there is?

6. Does the shape of an object affect if it will sink or float?

7. Can we change something from a “sinker” to a “floater”?

Various objects sink or float in water. Whether an object sinks or floats in a liquid depends mainly on two factors: density and buoyancy. Observing that the same objects will sink or float every time, i.e., that there is consistency in the way the objects behave, helps students devise their own ideas about physical properties and how they can be used to describe and categorize objects.

Note similarities and differences in the physical characteristics of objects. Do these characteristics affect whether the solids float or sink? For example, objects made of metal will usually sink. Children may come to the conclusion that heavier objects generally tend to sink in water. However, children should understand that weight is not the only factor. As they continue to investigate floating and sinking, children should begin understanding that objects float because a force equal to the weight of the water they displace buoys them up.

How does a boat or ship carrying hundreds of pounds worth of stuff float while that same stuff would sink to the bottom of the ocean if dumped overboard? How come when you're in a pool and you stretch your body out flat you float. But, if you wrap your arms around your legs and curl up into a ball you sink? Well, it all has to do with how much water is pushing against you and a scientific principle called buoyancy or *floatation*. Buoyancy is the loss in weight an object seems to undergo when placed in a liquid, as compared to its weight in air. When you stretch out flat in water, more water pushes against you since your body is laid out flatter. Buoyancy is the upward force that keeps things afloat. When placed in water, an object will float if its buoyancy is greater than its weight. And, the object will sink if its weight is greater than its buoyancy.

If the total area of the object that makes contact with the water is large enough, the object floats. The object must make room for its own volume by pushing aside, or *displacing*, an equivalent (or equal) volume of *liquid*. The object is exerting a downward force on the water, and the water is exerting an upward force on the object. The floating object's weight also comes into play. The solid body floats when it has displaced just enough water to equal its own original weight. *Archimedes' principle* **states that an object fully or partly immersed in a liquid is buoyed upward by a force equal to the weight of the liquid displaced by that object. From this principle, Archimedes concluded that a floating object displaces an amount of liquid equal to its own weight. Therefore, the amount of weight an object apparently "loses" when placed in water is equal to the weight of the water the object displaces.**

Thinking about the soda cans, they contain mostly water. They also contain some other ingredients and a small amount of air. If the soda is of a similar density to water, the can will float due to the presence of a small air pocket. Some cans sink because their effective density (mass/volume) is greater than water. Most regular soda cans contain a lot of sugar. Therefore, their density is higher than water and they sink. Diet sodas use a chemical that is much sweeter than sugar. It only takes a small amount of this chemical (artificial sweetener) to sweeten the soda, compared to regular soda with sugar.