# Density and Water

| Vocabulary | |
|---|---|
| density | atoms |
| mass | molecules |
| volume | |

**Density** is the amount of particles or atoms packed into a substance. The more tightly packed together the particles are, the denser the substance is.

Density shows the relationship of an object's **mass** to its **volume**. In other words, density refers to how many particles or atoms fit into a space. The more atoms in the space, the denser the substance is.

If you have two objects of the exact same size (volume), the denser object will have a greater mass than the less dense object.

There are two things contributing to density:

- The mass of the **atoms** or **molecules** that makes up the material.
- The volume or amount of space the material takes up.

If the molecules or atoms are packed tightly, the substance will be denser.

The density of water is 1 gram per milliliter or 1 gram per $cm^3$.

## Let's experiment so we can see how density works!

Will a can of regular soda sink or float in a tank of water? Will a can of diet soda sink or float in the same tank of water?

### Supplies

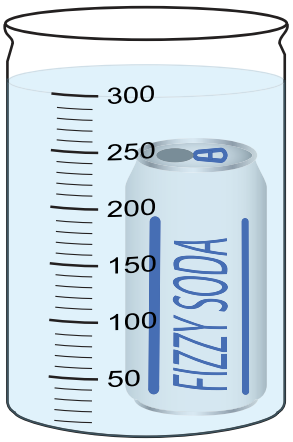
- 1 clear tank or bucket of water filled ¾ of the way to the top (it must be deep enough to submerge the soda can)
- 1 can of diet soda
- 1 can of regular soda of the same brand

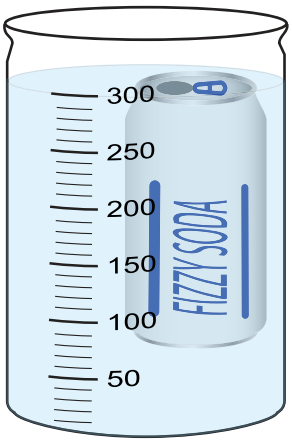
### Make a Prediction

What do you think will happen when you place the two soda cans in the bucket of water?

### Directions

1. Examine the ingredients on the side of each can.
2. Note the volume of soda in each can.
3. Gently place the can of regular soda into the bucket of water.
4. Gently place the can of diet soda into the bucket of water.



## Questions

1. What happened?

2. Why do you think this happened? (Hint: look at the nutritional values on each of the cans of soda.)

3. Can you think of where you might have seen something like this happen before?

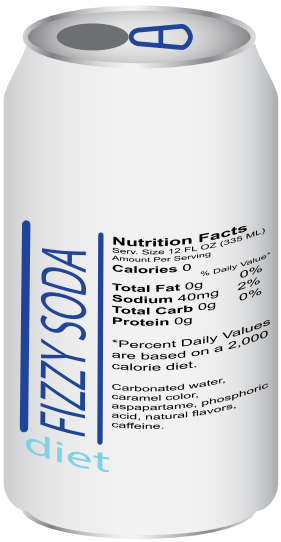

Objects less dense than water float, and those denser than water sink.

The main difference between the two cans is the amount of sugar in the soda. The regular soda contains many sugar molecules. In fact, most regular cans of soda have about 39 grams of sugar. This makes the regular soda denser than water, causing it to sink. (Thirty-nine grams equal about 10 packets of sugar!)

Now let's check out the ingredients on the diet soda can.

The diet soda has aspartame in it. Aspartame is an artificial sweetener. Aspartame is concentrated, and only a small amount is needed to give something a sweet taste.

All things equal (including the can), there are many more molecules packed into the can of regular soda than the diet soda.



## Review Questions

1. Can two objects with the same volume have different masses?

2. What two things does density depend on?

3. What do you think it means when an area is densely populated?

4. Fill in the definitions in the vocabulary box.

| Vocabulary | |
|---|---|
| **density** | |
| **mass** | |
| **volume** | |
| **atom** | |
| **molecule** | |