

Pepper and Soap Experiment

Rub-a-dub-dub, there's pepper in my tub! In this experiment, you'll use pepper floating on water to demonstrate how soap affects the surface of water. This is a quick experiment, but it's so fun to watch that you'll want to repeat it several times.

Problem:

How does soap interact with water?

Materials:

- Shallow bowl or pie tin
- Water
- Pepper
- Dish soap
- Toothpick
- Paper
- Pencil

Procedure:

1. Fill the bowl or pie tin with about an inch of water.
2. Sprinkle pepper evenly across the surface. Try not to sneeze! The pepper flakes should float, not sink, upon the surface of the water.
3. Squeeze a tiny bubble of dish soap onto a clean counter.
4. Touch the tip of the toothpick to the bubble of dish soap. You'll want just a tiny amount of soap on the end of the toothpick.
5. Set the toothpick carefully aside and pick up your notebook and pencil.
6. What do you think will happen when you touch your soapy toothpick to the water? How will the pepper flakes react?
7. Write down your best, often called a **hypothesis**, in your notebook.
8. Now poke the soapy toothpick into the water, right in the center of the tin.
9. What happens? Was your hypothesis correct?

Results:

Most of the pepper flakes should have darted to the sides of the pan, and some of the flakes should have fallen to the bottom of the pan. It may have looked like the soap was chasing the pepper flakes away.

Why?

The first question to ask is why the pepper flakes float. Why don't they sink or dissolve in the water? Well, pepper is **hydrophobic**, meaning that water is not attracted to it. Because of that, the pepper can't dissolve in the water. But why do the flakes float on top of the water? Water molecules like to stick together. They line up in a certain way that gives the top of the water surface tension. Because pepper flakes are so light, and hydrophobic, the surface tension keeps them floating on top.

The next question to think about is why the pepper shoots to the sides when soap touches the water. Soap is able to break down the surface tension of water—that's part of what makes soap a good cleaner. As the soap moves into the water, and the surface tension changes, the pepper no longer floats on top. But the water molecules still want to keep the surface tension going, so they pull back away from the soap, and carry the pepper along with them.

Do you think soap is the only substance that can break down water's surface tension? Try conducting the same experiment but with olive oil or hair spray. Do you think the pepper flakes will react in the same way?

