

# Bubble Trouble

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When water flows over rocks, minerals like calcium, magnesium, and iron get into the water. Water which contains a lot of minerals in it is called hard water. Let's make some hard water and see how it affects the bubbles that can be made with liquid dish detergent.

## Materials:

- 3 Disposable, clear, plastic bottles with caps (0.5 L or 20 oz. – The bottles should be the same size and shape.)
- Metric ruler
- Permanent marker
- Distilled water
- Food coloring (optional)
- Measuring spoons
- Liquid dishwashing detergent
- Epsom salt
- Clock or timer with second hand

## Procedures:

1. Use the ruler to measure 2 cm (1 inch) up from the bottom of one of the bottles, and make a mark with the permanent marker.
2. Using the mark as your guide, draw a line all the way around the bottle that is 2 cm (1 inch) from the bottom. You may need to make a few more guide marks with the ruler to make the line straight. This line will be your water line.
3. Using the ruler again, measure up from the water line that you just made, and mark every centimeter (1/2 inch) until you get to the top of the bottle. Number the marks as you make them starting with 1 for the first mark above the water line.
4. Repeat steps 1–3 for the other two bottles.
5. Using the marker, label the side of one of the bottles “water”, the side of another one “water + detergent”, and the side of the last one “water + detergent + salt”.
6. Carefully add water to each of the bottles, stopping at the water line. If you add too much water, just pour some out and try again.
7. Add one-quarter (1/4) teaspoon of dishwashing detergent to the bottles labeled “water + detergent”, and “water + detergent + salt”.
8. Add one-quarter (1/4) teaspoon of Epsom salt to the bottle labeled “water + detergent + salt”.
9. Tightly cap each of the bottles, and shake each one for 5 seconds.
10. Write down how many centimeters (or inches) of bubbles you observed in each of the bottles.
11. Wash your hands and thoroughly clean the work area. Pour the liquids down the drain, and throw the bottles in the trash.

## Think about this ...

Have you ever tried to use soap in ocean water? Water from the ocean has lots of calcium carbonate, salts, and other minerals dissolved in it. Why do you think it might be difficult to get things clean using soap in ocean water?

## Where's the Chemistry?

When people complain about “hard” water” they notice that the water reduces the amount of bubbling in the sink or washing machine. They also notice that their dishes and clothes don't seem to get as clean. They might even see small bits of soap that just won't dissolve in the water. Hard water can be a problem! In this activity, the magnesium from the Epsom salt combined with chemicals in the dish detergent to form something new--soap scum. This combining actually changes the dish detergent so that it cannot make bubbles. The changed dish detergent can't clean the grease off of dirty dishes either.

