

# Chemistry and Physics: Building Bubbles



## MAIN IDEA

Explore the phenomenon of surface tension by creating bubbles. Experiment with different combinations of materials to build your own bubble mix!

## SCIENCE BACKGROUND

Bubbles are created when air is blown or wrapped in a thin film of soapy water. Bubbles cannot be blown with water alone due to water's high surface tension, an important property of water. Surface tension is the strong cohesive forces on the surface layer of a liquid due to molecular bonds that works to hold the liquid together and resist external forces. In other words, surface tension helps create a kind of skin on the surface of the liquid to help keep the molecules together, like with raindrops.

However, when soap is added, it creates a new solution. This soapy water solution has a weaker surface tension than pure water, which allows us to blow bubbles. When air is blown through the soapy water solution, a bubble forms due to a 3-layer film of soap and water molecules around the air. Similar to a sandwich, the outside and inside film layers (the bread) are soap molecules with a thin layer of water molecules in-between.

Soap also helps lengthen the evaporation time of a bubble to help it last longer. Adding additional materials, such as light corn syrup and/or glycerin, to the soapy water mixture can further change the physical properties of the liquid solution and the bubbles it creates. A thicker film on a bubble will cause the middle layer of water to evaporate more slowly. However, if your film is too thick, it could be very difficult to blow a bubble. Conversely, a thinner film on a bubble will cause the middle layer of water to evaporate more quickly. If your film is too thin, the bubble will pop before you can finish blowing it.



## MATERIALS

Bowl

Dish soap (or shampoo, hand soap, or detergent) – ½ cup

Measuring cups and spoons

Pipe cleaners, string or straws

Water – ½ cup

*Optional:* baking powder, cornstarch, glycerin and/or light corn syrup

*Optional:* stopwatch or smartphone stopwatch app

## ACTIVITY PROCEDURE

**Step 1:** Start by using a spoon to mix one-half ( $\frac{1}{2}$ ) cup of water with one-half ( $\frac{1}{2}$ ) cup of dish soap to create a bubble solution.

**Step 2:** Make a bubble wand for testing your solution. You can use a pipe cleaner, wire, string, or even connect two straws into a circle shape. You can also use a premade bubble wand if you already have one.

**Step 3:** Test your solution by trying to blow a bubble with your wand.

*Optional: You can also try timing how long it takes for your bubble to pop using a stopwatch!*

- ✔ What do your bubbles look like?
- ✔ How long does it take for your bubbles to pop?

**Step 4:** Experiment with different solutions to see how it changes your bubbles. Possible additions that you can add to your solution include baking powder, cornstarch, glycerin and/or light corn syrup. Keep track of each additive you put into your bubble solution (1 tbsp at a time).

- ✔ What do your bubbles look like?
- ✔ Is your solution harder or easier to blow into a bubble?

**Step 5:** Continue experimenting and creating until you are happy with the bubbles your solution creates. You can also try different amounts of water and soap to see what happens.

*Pro tip: Use a new bowl to try each different combination and then compare them.*

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## EDUCATIONAL STANDARDS

**Grade 1** – Big Idea 1: Nature of Science

SC.1.N.1.2 - Using the five senses as tools, make careful observations, describe objects in terms of number, shape, texture, size, weight, color, and motion, and compare their observations with others.

**Grade 4** – Big Idea 8: Properties of Matter

SC.4.P.8.2 - Identify properties and common uses of water in each of its states.

**Grade 8** – Big Idea 8: Properties of Matter

SC.8.P.8.9 - Distinguish among mixtures (including solutions) and pure substances.

**Grade 9-12** – Big Idea 8: Properties of Matter

SC.912.P.8.6 - Distinguish between bonding forces holding compounds together and other attractive forces, including hydrogen bonding and van der Waals forces.

## ADDITIONAL RESOURCES

**Bill Nye- Surface Tension**

<https://www.youtube.com/watch?v=Hm52rkh68JA>

**Surface Tension and Water**

[https://www.usgs.gov/special-topic/water-science-school/science/surface-tension-and-water?qt-science\\_center\\_objects=0#qt-science\\_center\\_objects](https://www.usgs.gov/special-topic/water-science-school/science/surface-tension-and-water?qt-science_center_objects=0#qt-science_center_objects)

**Bubbles**

<https://www.exploratorium.edu/ronh/bubbles/>

**The Science Behind Bubbles**

<https://www.kidsdiscover.com/teacherresources/bubbles-for-kids/>

