

# Solve the Mystery of the Unpoppable Balloon!

Calling all science detectives! Here's a mystery that may leave you stumped. The scene: two balloons, both held up to the same flame, react in two completely different ways. How can this be? Try this experiment and see if you can solve the mystery of the unpoppable balloon!

This fascinating science experiment brings the concept of heat transfer explosively to life and is sure to leave your curious young detective intrigued. Not only will this experiment help deepen your child's understanding of an important scientific concept, but it will also give him a chance to exercise his powers of observation and deduction as he works to solve its mystery.

Caution: this activity requires the use of an open flame. Safety goggles and adult supervision are a must!



## What You Need:

- Cigarette lighter or candle
- Matches
- 2 medium or large balloons
- Water (enough to fill one balloon)
- 2 pairs of safety goggles (one for you and one for your child)

## What You Do:

1. Have your child put on his safety goggles. Don't forget to put on your own!
2. Inflate one of the balloons and have your child carefully hold it away from his body.
3. Hold the lighted candle or cigarette lighter close to, but not touching, the balloon while your child holds it. Watch the balloon carefully while you do this. What happens?
4. Have your child fill the second balloon with cool or cold water until it swells to the size of a grapefruit.
5. Carefully blow a tiny puff of air into the balloon.
6. While your child holds the water-filled balloon, repeat step 3. What happens this time? What do you see on the surface of the balloon?
7. Now it's time to solve the mystery! Ask your child why the first balloon popped while the second one did not. Try looking for clues together that might reveal the answer. You might observe, for example, that the first balloon began to melt and/or catch fire before it popped while the second one only began to char. Why do you think this happened? If your child deduces that the second balloon didn't pop because the water affected its temperature, he's almost there!

## What Happened?

The answer to the mystery of the unpoppable balloon lies in the process of heat transfer. When something hot (the flame) comes into contact with something cooler (the balloon), thermal energy transfer, or heat exchange, occurs.

What does that mean for our two balloons? In the first experiment, the balloon absorbed the full intensity of the flame's heat because the air inside the balloon had little effect on the transfer of thermal energy. Unable to withstand the intense heat, the balloon started to melt and then literally disintegrated.

Why did the second experiment yield a different result? Compared to air, water is pretty good at

absorbing heat energy. In other words, water is more conductive. When you held the flame up to the balloon the second time, the water inside the balloon absorbed the flame's thermal energy. In the first experiment, the heat had nowhere to go but into the balloon. Here, however, the heat moved through the balloon and into the water, thus lowering the intensity of the heat on the balloon's surface. The structural integrity of the balloon remained solid because the rubber did not get hot enough to burst. Elementary, my dear Watson!

And what was that black substance on the second balloon? It was carbon, which forms as a by-product of the burning, or combustion, process—just as the wood in your campfire turns black before it is consumed.

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