

# Bowwow Barker Training 013: Thrilling Thermal Energy

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## Biblical Integration

“In the beginning was the Word, and the Word was with God, and the Word was God. He was with God in the beginning.” John 1:1-2

## Objective

Using superhero strengths of inquiry and responsibility, discover how thermal energy can be transferred and the effects of transferred thermal energy on a balloon.

## Vocabulary

- **Thermodynamics:** the study of heat, energy, and motion
- **First Law of Thermodynamics:** energy cannot be created or destroyed
- **Energy:** the ability to do work
- **Thermal energy:** the energy contained within a system that is responsible for its temperature
- **Kinetic energy:** the energy an object has because of its motion
- **Potential energy:** the stored energy an object has because of its position or state

## Materials

- 2-4 latex balloons
- Candle in a jar (not a candlestick)
- Measuring spoons
- A small funnel (this material isn't necessary but makes one step of the procedure easier)
- 3 tablespoons of water
- Lighter or matches

## Lesson: Thrilling Thermal Energy

The First Law of Thermodynamics states that energy cannot be created or destroyed. It always exists.

However, while it cannot be created or destroyed, it *can* be transferred. Energy can be transferred in several ways, including mechanically, electrically, by radiation, or by heat.

When energy is transferred by heat, it can be transformed into kinetic energy or potential energy. In today's activity, we will see thermal energy transferred as both types.

John 1:1 tells us, "The Word was with God and was God from the very beginning."

Just as energy cannot be created or destroyed, God cannot be created or destroyed. He is the beginning and the end. He always was and always will be.

It is both comforting and empowering to know that the God we serve is the one true God who will never be defeated. He will always be victorious!

Today, you will use the materials listed to see how thermal energy can be transferred as you put the first law of thermodynamics to the test!

### Challenge Parameters:

Parent: This experiment must be conducted by you as it uses an open flame.

### Procedure

#1. Have a parent light the candle. Blow up the balloon and tie it securely. Answer questions 1-3 on the data sheet.

#2. Have a parent hold the tied balloon over the flame. Answer question 4 on the data sheet.

#3. Add water to the second balloon using the funnel. Tie securely. Answer question 5 on the data sheet.

#4. Have a parent hold the water-filled balloon over the flame for 5 seconds. Answer question 6 on the data sheet.

#5. Answer question 7 on the data sheet to make a prediction about what will happen in the next step.

#6. Now, the parent will hold the water-filled balloon on top of the candle so that the flame goes out. Pull upward on the balloon.

#7. Read John 1:1-2. Answer question 8 on the data sheet.

## Data Sheet

1) What do you see? List the materials that are in front of you.

2) Prediction: Make a prediction about how you think the materials will be used in this experiment.

3) Hypothesis: What do you think will happen to the balloon when it is held over the flame?

4) What happened to the balloon? Was your hypothesis correct?

5) Hypothesis: What do you think will happen to the water-filled balloon when it is held over the flame?

6) What happened to the balloon? Was your hypothesis correct?

7) Hypothesis: What will happen to the balloon and the candle when the water-filled balloon is placed on top of the candle?

8) Was your hypothesis correct? Why or Why not?

9) What does this verse mean to you?

## Conclusion

When the first balloon was held over the flame, the heat from their cannulae burned a tiny hole in the balloon, causing it to burst. This is an example of thermal energy (candle heat) transferring to a new object (balloon) to cause a kinetic energy reaction (bursting).

This happened because the tiny atoms of the balloon were heated, and therefore moved away from each other. This caused the balloon to expand, producing a hole which led to the balloon bursting.

In the second experiment, the heat was transferred to the water inside of the balloon. This caused a potential energy reaction. The heat was stored inside of the balloon as it was absorbed by the water. This prevented the balloon from melting or bursting.

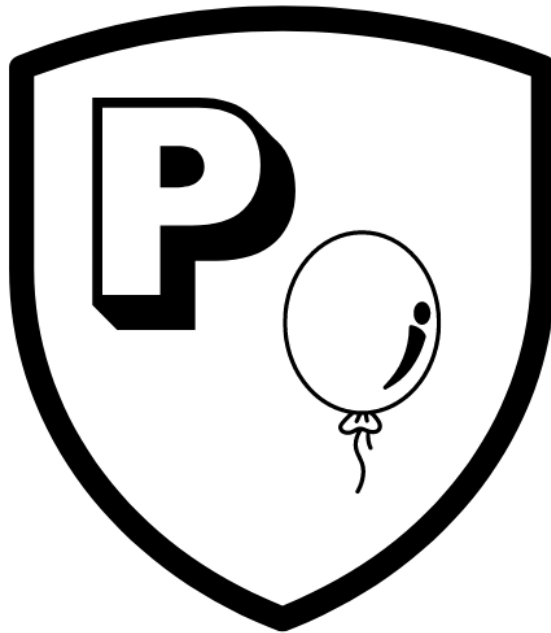
In the final experiment, the heat energy from the candle expanded the air molecules around it. When the flame is put out by the balloon, the air molecules are trapped as they cool. The cooling causes contraction, which causes a suction motion, which sucked the balloon down around the candle.

A superhero must rely on strength that he or she has within himself.

But as Christians, we can rely on strength from God. And as John 1:1-2 tells us, God has always existed—even from the very beginning of time. How great is our God and

how great is the strength we can draw from Him as we face evil and injustice in our lives!

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