



KEEPING THINGS HOT!

MATERIALS:

- **TWO (2) GLASS TEST TUBES**
- **ONE (1) 20-OUNCE DRINK BOTTLE**
- **CHILDREN'S MODELING COMPOUND OR TAPE**
- **TWO (2) THERMOMETERS**
- **ALUMINUM FOIL**
- **HOT WATER**
- **PAPER**
- **PEN OR PENCIL**



PROCEDURE:

1. Take one of the glass test tubes, and wrap it with a piece of aluminum foil (6 in. x 6 in. square).
2. Place the foil-wrapped test tube inside the mouth of the 20-ounce drink bottle until the top of the test tube is flush with the top of the bottle. Use the modeling compound or tape to hold the test tube in place.
3. Fill both test tubes with hot water.
4. Insert a thermometer into each tube, and seal it in place using a small piece of aluminum foil.
5. On a piece of paper, record the initial temperature of the water in each test tube.
6. Take both the test tube and the test tube/bottle and place them in the freezer.
7. Record temperatures in both test tubes every minute. What happens?

WHAT THIS MEANS:

The glass wall inside of a thermos is shiny silver (like aluminum foil). The space between the glass and the outer wall of a thermos creates a vacuum, or lack of air atoms. Both the shiny silver inner wall and the vacuum greatly reduce heat transfer by **convection**, **conduction** and **radiation**.

As a result, a thermos limits heat transfer through the walls of the container. This allows the fluid inside to maintain its temperature for a long period of time, whether the temperature is hot or cold.

GLOSSARY:

Convection: Heat transfer by fluid motion between regions of unequal density that result from non-uniform heating.






Conduction: The process by which heat is directly transmitted through a substance when there is a difference of temperature between adjoining regions, without movement of the material.

Radiation: Emission of energy as electromagnetic waves or as moving subatomic particles, especially high-energy particles that cause ionization.

Making Science Make Sense[®] is Bayer's award-winning, company-wide initiative that advances science literacy through hands-on, inquiry-based science learning, employee volunteerism and public education.



For more information,
please visit MakingScienceMakeSense.com

-  **Facebook** facebook.com/Bayer
-  **Twitter** [@BayerUS](https://twitter.com/BayerUS)
-  **Instagram** [@BayerUS](https://instagram.com/BayerUS)
-  **YouTube** youtube.com/user/BayerChannel
-  **Pinterest** pinterest.com/BayerUS