



# Watts On Your Mind?

Solar energy educational activities for schools

## Activity Overview

Grade Level: 3-5

Activity: UE-2

## General Description

Students will make a thermometer and will learn to convert temperatures between Fahrenheit and Celsius scales.

## Learning Outcome

Students will observe that thermometers measure thermal energy. Students will understand the dynamics of how a thermometer works.

## Subjects

Science

## Process Skills

Observation, measurement, construction

## Duration

1 hour

## Key Vocabulary

Fahrenheit, Celsius, Kelvin, absolute zero

## Curriculum Standards

Texas (TEKS):

112.6.a.2, 112.7.b.5.8,

112.6.b.4.11

Louisiana (LSCS):

PS-M-C3

Arkansas (ASCF):

3.1.4

National (AAAS Project 2016):

The Designed World – 5th

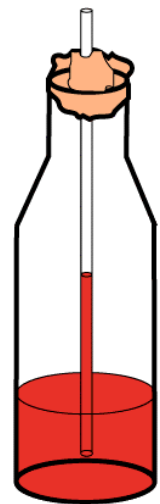
## Make a Thermometer

### Materials

- Tap water
- Rubbing alcohol (note: rubbing alcohol is poisonous so be careful with it)
- Clear, narrow-necked plastic bottle (11-ounce water bottles work well)
- Food coloring
- Clear plastic drinking straw
- Modeling clay

### Method

1. Pour equal parts of tap water and rubbing alcohol into the bottle filling about 1/8 to a 1/4 of the bottle.
2. Add a couple of drops of food coloring and mix.
3. Put the straw in the bottle, (DO NOT DRINK MIXTURE) but don't let the straw touch the bottom.
4. Use the modeling clay to seal the neck of the bottle, so the straw stays in place.
5. Now hold your hands on the bottle to warm it and watch what happens to the mixture in the bottle.





# Watts On Your Mind?

*Solar energy educational activities for schools*

---

## Discussion

A thermometer is an instrument that measures the temperature. Temperature is measured in a scale called Fahrenheit (in the United States) and in Celsius or Centigrade (in many other countries). The point where water freezes is 32 degrees Fahrenheit (F for short) and 0 degrees Celsius (C). The point where water boils is 212 degrees F and 100 degrees C. If you want to know how to convert from F to C or from C to F, see the end of this page.

Some scientific thermometers use the Kelvin scale, where 0 degrees Kelvin is called absolute zero—a place where there is no movement of any parts of matter, where substances have no thermal energy. It's about minus 273.15 degrees C (below 0° C) or 459.67 degrees below 0° F. Scientists have never been able to measure anything at absolute, absolute zero.

Thermometers help us know what the weather is like. If it will be 90°F outside, we're not going to put on a winter coat. Or if it's below zero, we won't be wearing shorts. This activity presents a way to show how a simple thermometer works.

In the thermometer we made in this activity, the air in the bottle expands when it is warmed. This makes the liquid no longer fit in the bottom of the bottle. As the air expands it forces the colored liquid mixture to move up through the straw. If the bottle were to get very hot, the liquid would come out through the top of the straw.

Students can watch the thermometer and see how the liquid changes throughout the day. What happens if the thermometer is in shadow or in sunlight? What happens when it gets colder? How does wind affect the thermometer?

Of course, in order to accurately read the temperature, you will need to buy a real thermometer that is carefully calibrated for temperature changes. This one is to see how a thermometer works – just for fun.

After students are finished, dispose of the liquid properly and rinse the bottle well. Cut it in half, or have a teacher cut it in half, so the bottle can't be reused. Then recycle the plastic. The used bottle could have some left over alcohol in it, and you don't want anyone to reuse the bottle for drinking water.

## Assessment

Possible assessment techniques include: quiz, writing assignment or a journal entry.

Source: This activity adapted from “Thermometers” created by the Florida Solar Energy Center.