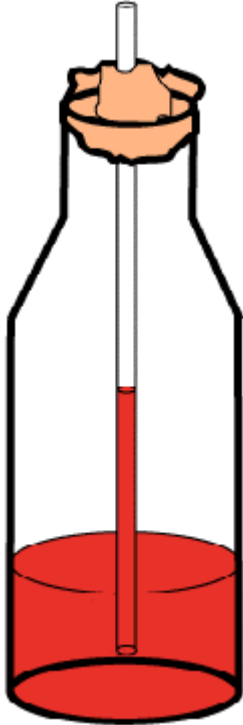


Name: \_\_\_\_\_

## Make a Thermometer

Modified from <http://www.energyquest.ca.gov/projects/thermometer.html>



An instrument that measures the temperature is a thermometer. Most people in the United States measure temperature in a scale called Fahrenheit. Celsius or Centigrade is commonly used by scientists and people in other countries. Water freezes at 32 degrees Fahrenheit (F) and 0 degrees Celsius (C). The boiling point of water is 212 degrees F and 100 degrees C.

### Materials:

1. Water from the tap.
2. Rubbing Alcohol (be careful not to consume)
3. Clear, narrow-necked plastic bottle (water bottles work well)
4. One color of food coloring.
5. Clear plastic straws for drinking
6. Modeling clay

### Directions:

1. Combine an equal amount of tap water and rubbing alcohol into the bottle, filling about  $\frac{1}{8}$  to  $\frac{1}{4}$  of the container.
2. Add a few drops of food coloring and gently mix by rotating the food coloring with the tap water and rubbing alcohol.
3. Place the straw in the bottle. Be careful to not let the straw touch the bottom of the clear, narrow-necked plastic bottle. (**DO NOT DRINK THE MIXTURE**).
4. Place the modeling clay as a seal at the neck of the bottle. This will also secure the straw in place.
5. Cup your hands around the bottle and watch what happens to the mixture of food coloring, tap water, and rubbing alcohol.

### Exploration:

What did you notice when you placed your hands around the mixture in the plastic bottle? Why do you think this occurred?

Thermometers work when liquid expands as it is warmed. When the liquid expanded, it no longer fit in the bottom of the plastic bottle. When the alcohol

expanded, the colored mixture moved up the straw. If the mixture continued to get hotter, the mixture would move through the top of the straw.

You can watch your thermometer throughout the day to see how the liquid inside the plastic bottle changes. What would happen if your thermometer is placed in a shadow or in direct sunlight? What happens if your thermometer is placed in a cold area? How does wind affect your device?

### **Changing Fahrenheit Scales**

The Fahrenheit Scale is named after Gabriel D. Fahrenheit as a way to measure temperature. The Celsius Scale is named after Anders Celsius, an inventor and is also called Centigrade. The Centi means 1/100 (one one-hundredth) for the 100 equal divisions on the scale. The Celsius Scale is the most commonly used scale to measure temperature in the world. The difference in Celsius temperature between water freezing and boiling is 100 degrees. Using the Fahrenheit scale, the difference between freezing (32 degrees) and boiling (212 degrees) is 180.

You can change the temperatures from Fahrenheit to Celsius using mathematics. Take a number; subtract 32 degrees from it; and divide it by 1.8.

Example:

Change 80 degrees Fahrenheit into Celsius.

$$80 - 32 = 48$$

$$48 / 1.8 = 26.66 \text{ degrees Celsius.}$$

So, 48 degrees Fahrenheit is equal to 26.66 degrees Celsius.

You can also change the temperature from Celsius to Fahrenheit using mathematics. Take a number; multiply it by 1.8; and add 32.

Example:

Change 16 degrees Celsius to Fahrenheit.

$$16 \times 1.8 = 28.8$$

$$28.8 + 32 = 60.8 \text{ degrees Fahrenheit.}$$

So, 16 degrees Celsius is equal to 60.8 degrees Fahrenheit.

Try calculating two more temperatures from Fahrenheit to Celsius and two from Celsius to Fahrenheit. Have fun and share your findings with a partner!