http://www.energyquest.ca.gov/projects/images/h-thermometer.gif

|  |  |
| --- | --- |
| A thermometer is an instrument that measures the temperature. Temperature is measured in a scale called Fahrenheit (by most people in the United States) and in Celsius or Centigrade (used by scientists and by people 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**](http://www.energyquest.ca.gov/projects/thermometer.html#calculate).  Some scientific thermometers use the Kelvin scale, where 0 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 zero, though they have gotten very close.  Thermometers help us know what the weather will be 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. Here's a way to show how a simple thermometer works.  http://www.energyquest.ca.gov/projects/images/what-need.gif   1. Tap water 2. Rubbing alcohol (**do not drink this**) 3. Clear, narrow-necked plastic bottle (11-ounce water bottles work well) 4. Food coloring 5. Clear plastic drinking straw 6. Modeling clay | |
| http://www.energyquest.ca.gov/projects/images/what-to-do.gif  http://www.energyquest.ca.gov/projects/images/1.gifPour equal parts of tap water and rubbing alcohol into the bottle, filling about 1/8 to a 1/4 of the bottle. http://www.energyquest.ca.gov/projects/images/2.gifAdd a couple of drops of food coloring and mix. http://www.energyquest.ca.gov/projects/images/3.gifPut the straw in the bottle, but don't let the straw touch the bottom (**DO NOT DRINK THE MIXTURE**). http://www.energyquest.ca.gov/projects/images/4.gifUse the modeling clay to seal the neck of the bottle, so the straw stays in place. http://www.energyquest.ca.gov/projects/images/5.gifNow hold your hands on the bottle and watch what happens to the mixture in the bottle. | http://www.energyquest.ca.gov/projects/images/thermometer.gif |
| |  | | --- | | http://www.energyquest.ca.gov/projects/images/what-discover.gif  Congratulations!!! You just made a thermometer. Just like any thermometer, the mixture expanded when it was warmed. This made the liquid no longer fit in the bottom of the bottle. As the alcohol expanded the colored mixture moved up through the straw. If the bottle were to get very hot, the liquid would have come through the top of the straw.  You can watch your thermometer and see how the liquid changes throughout the day.  What happens if your 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 you're done with your thermometer, dispose of the liquid properly and rinse the bottle well. Cut it in half, or have a parent 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. So, it's best to recycle the bottle. |   **Changing Temperature Scales**  The Fahrenheit scale was named after Gabriel D. Fahrenheit who lived from 1686 to 1736. He devised a way of measuring temperature. The Celsius scale was named after Anders Celsius, its inventor, who lived from 1701-1744. The Celsius scale is also called Centigrade. The **Centi** in centigrade means 1/100 (one one-hundredth) for the 100 equal divisions on the scale and is used by scientists. It is the temperature scale used by most of the world. The difference between the temperature where water freezes and boils is an even number of degrees...100. In the Fahrenheit scale, the difference between freezing (32° F) and boiling (212° F) is 180.  You can **change the temperature in Fahrenheit into Celsius** using math. **Take your number; subtract 32° from it; and divide the remainder by 1.8.**  **Example**   Change 75 degrees Fahrenheit into Celsius.  75 - 32 = 43 43 / 1.8 = **23.88° C** So, 75° F is equal to 23.88° C  To **change the temperature in Celsius to Fahrenheit** using math. **Multiply your number by 1.8 and add 32°**  **Example**  Change 12 degrees Celsius into Fahrenheit.  12 x 1.8 = 21.6 21.6 + 32 = **53.6° F** So, 12° C is equal to 53.6° F | |