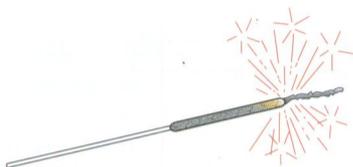


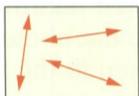
Thermometers

Thermometers are used to measure **temperature**.
Temperature is not the same thing as the total energy in an object.

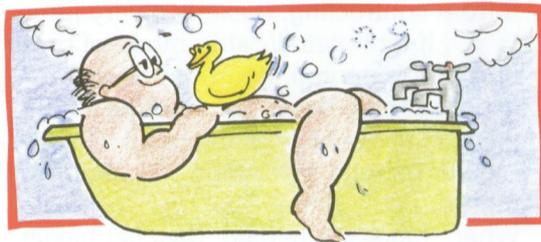
To understand this, let's compare a white-hot 'sparkler' firework with a bath-full of warm water:



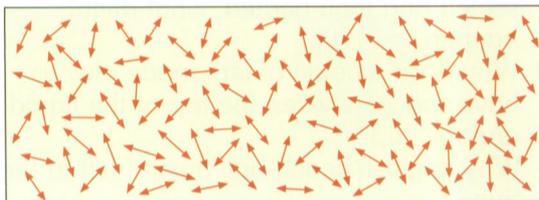
The tiny 'sparkles' are at a very high temperature but contain little energy because they are very small



Each sparkle contains a few molecules vibrating at very high temperature but with little total energy



The water is at a lower temperature but it contains more internal energy because it has many more molecules



The bath has many molecules, each vibrating at low temperature but with more total energy

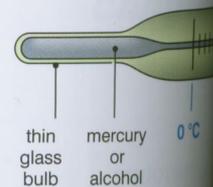
You can see that the bath has more energy. Its molecules have more **internal energy**. To raise the temperature of an object you must give more energy to its molecules. Heat energy travels from a hot object to a cold object.

A laboratory thermometer

This uses the expansion of a liquid to measure temperatures accurately. Look at the diagram opposite. If the liquid gets warmer, it expands along the tube, where there is a scale of numbers marked °C or **degrees Celsius** (or degrees centigrade). There is a vacuum (no air) above the liquid so it can move easily along the tube.

To make the thermometer **sensitive**, with a long scale, it should have a narrow-bore tube and a large bulb.

To make the thermometer **quick-acting**, it should have a bulb made of thin glass so that the heat can get through easily.



What is the reading?
(This is the temperature)

Choice of liquid

Mercury is used because it does not expand much with temperature rises and b) it is a liquid at room temperature. Mercury is poisonous.

Alcohol is often used for low temperature measurements. It boils at a lower temperature than mercury. Under normal conditions it boils at a lower temperature than mercury.

Temperature

In your experiment... This uses a thermometer... used to compare... stores the data...

A clinical thermometer... the temperature... has a thermometer... result:

Absolute

As substances... freeze into... colder, the... their lowest... temperature...

Scientists... begins at... means 0°C...

On a hot...