

## Temperature

The term “Thermodynamics” brings to mind the everyday term temperature. We often use terms like cold, hot, and temperature, but what do these terms actually mean scientifically. You might say that a hot object has a high temperature and a cold object has a low temperature, but what does this really mean. We will start by looking at how everyday temperature scales came about and eventually develop a more scientific definition of temperature.

### I. Temperature

A somewhat non-scientific definition of temperature used in everyday life is that temperature is a measure of how \_\_\_\_\_ or \_\_\_\_\_ something is.

A thermometer is an instrument for measuring the temperature of an object.

When one places an object into a stove or a refrigerator, many of the physical properties of the object change. For instance the object’s length may change with temperature.

One can make a thermometer by measuring any \_\_\_\_\_ of an object that changes with \_\_\_\_\_.

By selecting two arbitrary reference temperatures, it is possible to setup a temperature scale and to calibrate a thermometer.

Two common reference points for developing a temperature scale are the freezing point of water and the boiling point of water at 1 atm of pressure.

The Celsius and Fahrenheit scales are two everyday temperature scales based upon this process where we define the temperatures to be:

Boiling Point =

Freezing Point =

We can now use these definitions to calibrate a thermometer by measuring a temperature dependent property of an object at these two reference points and then dividing the change up equally over the temperature range.

Example: The length of a column of liquid in a glass tube.

This process of calibrating thermometers assumes that the property of the thermometer varies linearly with temperature (ie the curve is a straight line). Properties of materials are only approximately straight lines so while different types of thermometers can be made to match at the reference points their readings will be slightly different at other temperatures depending on the property used.