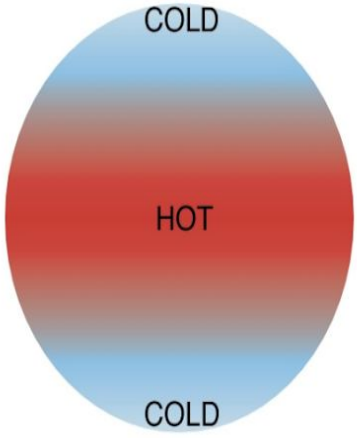
Heat And Temperature

Heat

Heat is the sum of kinetic energy of all molecules of a substance. We use the expressions of hot and cold in our daily life on a number of occasions. We use heat for cooking food and keeping our body warm. We can get heat from coal, gas or electricity and sun. The degree of hotness and coldness of an object is called its temperature. Temperature is usually measured in the Celsius scale or Fahrenheit. The normal human body temperature is 98.4^0 Fahrenheit or 36.9^0 Celsius.



Temperature

Temperature is a measure of how hot or cold a body is. Temperature is usually measured in the Celsius scale or Fahrenheit scale. Temperature of the system can be defined as the property that determines whether or not the body is in thermal equilibrium with the neighbouring system. If the number of systems is in thermal equilibrium, this common property of the system can be represented by the simple numeric value called temperature.

Differences between Heat and Temperature

The differences between heat and temperature can be summarised in points as follows:

S.N	Heat	S.N	Temperature
1.	Heat is the form of energy that flows from the system to its surroundings.	1.	Temperature is the result of heat.
2.	Mass of the body affects the total heat.	2.	Mass of body does not effect on temperature but depends on the molecular vibration of the body.
3.	Heat is measured in joules or calories. 4.2 Joules = 1 calorie	3.	Temperature is measured in degree Celsius or degree Fahrenheit or Kelvin Scale.
4.	Heat is measured by using a Calorimeter.	4.	Temperature is measured using the thermometer.

Thermometer

A device, which measures the temperature of a body, is called thermometer. Three temperature scales are used on thermometers: the Celsius, the Fahrenheit, and the Kelvin scale. Most liquid thermometers use mercury or alcohol as thermometric substances. The relationship between the reading on the temperature scales is given by the relation:

$$\frac{c-0}{100} = \frac{F-32}{180} = \frac{k-273}{100}$$

Precautions while using thermometer are:

1. The bulb of the thermometer should come in good contact with the object or dip well in the liquid whose temperature is being measured.
2. The thermometer should not touch the wall or sides of the container.
3. The thermometer should be held vertically.
4. The reading of mercury level in the capillary tube should be taken by taking the reading of the upper meniscus of mercury, keeping the eye on level with the meniscus.

Types of thermometer according to the choice of thermometric liquid

There are two types of thermometers according to the thermometric liquid used. They are:

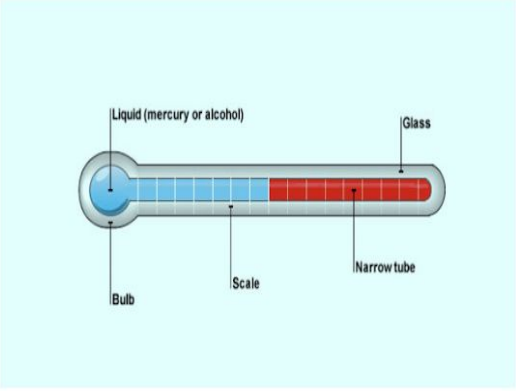
1. Mercury thermometer
2. Alcohol thermometer

Mercury thermometer

A mercury thermometer is used to measure the temperature of extreme hot places. Mercury thermometer can measure the temperature of -39^0 Celsius to 357^0 Celsius.

Advantages of use of Mercury in thermometer

1. It is shiny liquid.
2. It does not stick to the wall of the glass tube.
3. It expands uniformly.
4. It can be used for a wide range of temperature.



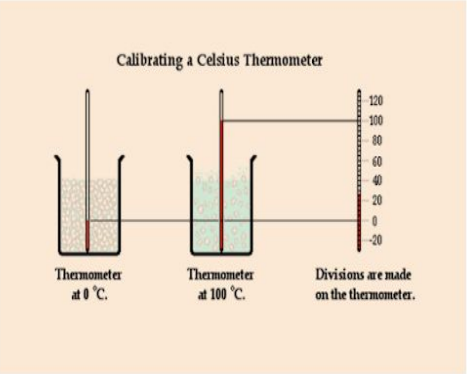
Alcohol thermometer:

An alcohol thermometer is used to measure the temperature of extreme cold places. Alcohol thermometer can measure the temperature of - 112^0 Celsius to 78.3^0 Celsius.

Advantages of use of Alcohol in thermometer

a. It is transparent; therefore, it has to be coloured before it is used.
b. It has low specific heat capacity.
c. It expands more than mercury (about six times) for the same rise in temperature.
d. Alcohol freezes at - 112^0 Celsius and boils at 78.3^0 Celsius.

Calibration of thermometer:



Marking of temperature scale on a thermometer is called calibration. Calibration is done in two ways.

1. By marking two fixed points i.e. lower fixed point and upper fixed point.
2. By dividing the interval between the lower and the upper fixed points either in 100 equal parts and labelling each part as one degree Celsius in Celsius scale or in 180 equal parts and labelling each part as one degree Fahrenheit in Fahrenheit scale.

To mark the fixed points

1. **Lower fixed point:**The lower fixed point is the temperature of melting point of pure ice at standard atmospheric pressure of 760 mm of mercury.
2. **Upper fixed point:**The upper fixed point is the temperature of the steam produced from the pure boiling water at the standard atmospheric pressure of 760 mm of mercury.

Importance of thermometer:

a. It is used to measure the temperature of the body.
b. It is used to measure the temperature of a room.
c. It is used to know the temperature of the water of an aquarium.